Report No. FAA-EQ-73-7, 2

AIRCRAFT NOISE DEFINITION
Individual Aircraft Technical Data
Model 707

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P.O. Box 3707
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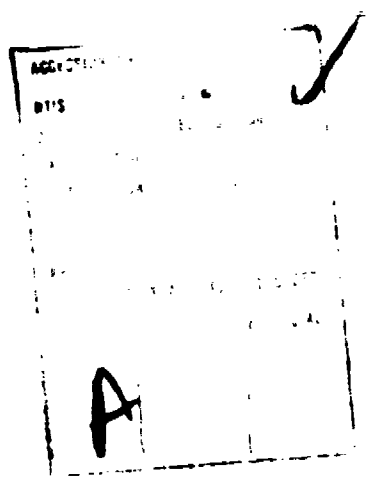
DECEMBER 1973

FINAL REPORT

Prepared for
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Office of Environmental Quality
Washington, D.C. 20591



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TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FAA-EQ-73-7-2		

4. Title and Subtitle
AIRCRAFT NOISE DEFINITION
Individual Aircraft Technical Data Model 707

5. Report Date
Dece[redacted]73

6. Performing Organization Code

7. Author(s)
B. G. Williams and R. Yates

8. Performing Organization Report No.
D6-42141-1

9. Performing Organization Name and Address
Boeing Commercial Airplane Company
P.O. Box 3707
Seattle, Washington 98124

10. Work Unit No.

11. Contract or Grant No.
DOT-FA73-WA-3254

13. Type of Report and Period Covered
Contractor Report

12. Sponsoring Agency Name and Address
Federal Aviation Administraton
800 Independence Avenue S.W.
Washington, D.C. 20591

14. Sponsoring Agency Code

15. Supplementary Notes
Deliverable item 4b of attachment 1 of the contract.

16. Abstract

Technical data are presented for graphically determining takeoff, cutback, and approach performance and noise under the flightpath for various Boeing Model 707 aircraft currently in operation. Data are included for all certified flap positions and cover operations from airports from sea level to 6000 ft altitude at temperatures from 30° to 100°F with winds from -10 to +30 kn over the entire operational weight range. Noise data are shown for units of EPNdB and dB(A) from takeoff to low approach thrust and for aircraft altitudes between 200 and 12,000 ft.

17. Key Words	18. Distribution Statement
Aircraft noise Boeing aircraft Takeoff performance Approach performance	Unclassified—unlimited

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	78	

Form DOT F 1700.7 (8-69)

390 145

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COMMERCIAL AIRPLANE DIVISION

DOCUMENT NUMBER	MODEL NUMBER	PURCH. AGREEMENT/W.O. NO.
D6-42141-1	707	

TITLE

AIRCRAFT NOISE DEFINITION -- INDIVIDUAL AIRCRAFT

TECHNICAL DATA - MODEL 707

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REVISIONS

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1.0 INTRODUCTION

This document was written in compliance with Attachment 1, Item 4b of Contract No. DOT-FA73 WA-3254 for the FAA.

This document contains performance and noise data in the form of graphs for Boeing Model 707 type aircraft.

The data in this document has also been tabulated and included in the "Boeing Airplane Noise/Performance Computer Program".

2.0 SUMMARY

The purpose of this document is to provide the necessary information to graphically determine the takeoff, cutback, and approach performance and noise under the flight path for various Boeing model 707 type aircraft currently in operation. Data is included for the 707-120B, 720B and 707-300B Adv./C type aircraft equipped respectively with JT3D-3, JT3D-1, and JT3D-3B engines. The JT3D-3B engines are fitted with the improved cowl (IC).

The performance data shown are for operation from airports with elevations of sea level to 6000 ft., with airport temperatures from 30°F to 100°F and with reported headwinds of -10 kt to 30 kt. Climbout speeds are constant V_2+10 kt, except data are included for the 707-300B Adv./C for constant V_2+20 kt and +30 kt climbout speeds. Corrections to cutback thrust required charts for these increased climbout speeds are also included. Approach thrust required charts are shown for constant speeds of $1.3V_s$, $1.3V_s$+10 kt, $1.3V_s$+20 kt, and $1.3V_s$+30 kt. Takeoff data is presented for all the certified takeoff flap positions (30° for the 707-120B, 20° and 30° for the 720B and 14° for the 707-300B Adv./C). Approach data are presented for the certified approach and landing positions of 30° gear up and 30°, 40°, and 50° gear down for the 707-120B, 30° gear up and 30° and 50° gear down for the 720B and 25° gear up and 25°, 40°, and 50° gear down for the 707-300B Adv./C.

The noise data are shown for units of effective perceived noise (EPNdB) and peak overall A weighted sound level (dBA). The range of data is from takcoff thrust to low approach thrust levels for aircraft heights from 200 ft. to 12,000 ft. Linear interpolation and extrapolation of this data is permitted between the limits of 2500 lb. $\leq F_n/\delta \leq$ 16,000 lb.

Corrections are also included for airport altitudes of sea level to 6000 ft. and airport temperatures from 30°F to 100°F. Velocity corrections to EPNL are included for aircraft true airspeeds between 100 and 250 KTAS.

A brief description of the aircraft performance and noise data basis is included in Section 3.

The chart reading procedure and worked examples are shown in Section 5.

3.0 DATA BACKGROUND

3.1 Performance Data Background

The model 707 type performance data included in this document are derived from certified aerodynamic and propulsion parameters determined during FAA certification flight tests.

The airplane takeoff and climbout performance are representative of the 707-120B, 720B and 707-300B Adv./C, each equipped with (4) Pratt and Whitney engines as shown below.

Model	Engine	S.L.S. Uninstalled Thrust ~ Lb.	Flat Rated T.O.
707-120B	JT3D-3	18,000	59°F
720B	JT3D-1	17,000	59°F
707-300B Adv.	JT3D-3B(IC)	18,000	84°F

Installed takeoff thrust was for average engines with 2 turbocompressors operating and anti-ice bleeds off.

The "Intermediate Stage Boeing Proprietary Computer Program" operates on the certified parameters for each of the above aircraft/engine combinations to produce takeoff distance and climbout profiles including information on aircraft height, distance, speed, and thrust available. Thrust required for cutback operations at each point for each combination of airport and atmospheric variables is also defined.

Data in this document comply with F.A.R. Part 25 regulations when used in conjunction with the respective model/engine flight manuals (Ref. 1, 2, 3). The 707-120B and 720B data are for attitude warning system (AWS) off. Distance to 35 ft. data for all three aircraft are shown as constant for BRGW at and below the weight that corresponds to the minimum rotation speed (1.05 minimum control speed) for the reference conditions of sea level, 77°F.

The charts should not be entered for any airport conditions with maximum brake release gross weights nor landing weights exceeding the following:

Model	Engine	Maximum BRGW ~ Lb.	Maximum Landing Weights ~ Lb.
707-120B	JT3D-3	258,000	190,000
720B	JT3D-1	234,000	175,000
707-300B Adv./C	JT3D-3B(IC)	333,600	247,000

The minimum realistic weights to consider for these 707-type aircraft are approximately:

Model	Engine	Minimum BRGW ~ Lb.	Minimum Landing Weights ~ Lb.
707-120B	JT3D-3	160,000	140,000
720B	JT3D-1	160,000	140,000
707-300B Adv./C	JT3D-3B	190,000	160,000

In addition performance gross weight limits shown in Refs. 1, 2 and 3 must be considered when using information in this document.

The climbout profiles between 35 ft. and 400 ft. are illustrated by connecting these points with a straight line. Actual flight profiles between these two points, particularly for the increased climbout speeds of V_2+20 kt and V_2+30 kt would probably deviate from this, but the end points are correct.

The V_2+10 kt speeds shown on the all engine climbout speed charts are approximations of actual climbout speeds. For determination of actual V_2 speeds the airplane Flight Manuals (Ref. 1, 2, and 3) should be used.

3.2 Acoustic Data Background

The acoustic data contained in this document were derived from flight test measurements discussed below.

3.2.1 Model 707/720 Series Airplanes With Baseline Nacelles

On May 31, 1973, a 707-320B airplane equipped with JT3D-3B engines and production baseline nacelles, performed a series of flight tests over an array of microphones located at Madera County, California. The tests were witnessed by FAA observers and complied with the requirements specified in Reference 4. The generalized noise data shown in pages 7.1.12 and 7.1.13 were derived from these tests.

3.2.2 Model 707/720 Series Airplanes with Quiet Nacelles

A series of acoustic tests were performed with a 707-320B airplane equipped with JT3D-3B engines and quiet nacelles on April 30, 1973. The tests were performed at Madera County, California, were witnessed by FAA observers and conducted in compliance with the requirements specified in Reference 4. The generalized noise data derived from these tests are shown in pages 7.1.14 and 7.1.15.

3.2.3 Noise Data Corrections

Noise data presented in the generalized noise curves are shown for conditions of sea level, 77°F, 70% relative humidity and 160 KTAS. To evaluate noise levels at other conditions, corrections have been developed using theoretical methods to account for the effects of:

1) atmospheric conditions on source noise generation
2) airplane velocity on duration correction, and
3) the effect of temperature on atmospheric absorbtion characteristics.

Corrections for atmospheric conditions are shown in page 6.9 and are applicable to both EPNL and dBA noise units. Corrections required to account for airplane velocity are shown in page 6.10 and are applicable only to noise levels expressed in EPNdB units.

The corrections developed to account for the effect of temperature on atmospheric absorbtion characteristics are complex and of doubtful accuracy due to lack of available

technology. In order to fulfill contractual obligations, corrections required to adjust noise data at 77°F to 59°F have been estimated and are presented in page 3.6. A more complete set of temperature corrections covering the range 30°F to 100°F are contained in the "Boeing Airplane Noise/Performance Computer Program.

TABLE 3.1

TEMPERATURE CORRECTIONS
(77° F to 59° F) *

MODEL 707 BASELINE NACELLE JT3D-1/-3/-3B

ALTITUDE~FEET	F_n/δ~THRUST~LB.	CORRECTION dBA	CORRECTION EPNdB
400	3630	0.2	0.1
400	5880	0.1	- 0.1
400	11990	0.1	0
400	15250	0	0.4
2000	3630	0.3	0.7
2000	5880	0.8	0.7
2000	11990	0.6	0.6
2000	15250	0.6	0.5
6000	3630	2.1	2.0
6000	5880	1.4	1.5
6000	11990	1.1	1.0
6000	15250	1.0	1.0

MODEL 707 QUIET NACELLE JT3D-1/-3/-3B

ALTITUDE~FEET	F_n/δ~THRUST~LB.	CORRECTION dBA	CORRECTION EPNdB
400	3490	- 0.2	- 0.1
400	6130	0	- 0.1
400	11830	0.1	0
400	13930	0.1	0.1
2000	3490	0.5	0.6
2000	6130	0.5	0.6
2000	11830	0.5	0.7
2000	13930	0.4	0.5
6000	3490	1.0	0.7
6000	6130	0.9	2.1
6000	11830	0.9	2.3
6000	13930	0.7	2.2

*These corrections are non-linear functions of temperature and therefore cannot be used to determine corrections at other temperatures.

4.0 REFERENCE LISTINGS

4.1 List of Figures

Generalized Noise Data, EPNdB, Quiet Nacelle	1.14	1.14	1.14
Generalized Noise Data, dBA, Quiet Nacelle	1.15	1.15	1.15

4.2 References

1. D6-1586, FAA Approved Airplane Flight Manual, Boeing Model 707-100B Series (P&W JT3D-3 Engines), The Boeing Company, Renton, Washington, March 23, 1962.

2. D6-1578, FAA Approved Airplane Flight Manual, Boeing Model 720B Series, The Boeing Company, Renton, Washington, March 3, 1961.

3. D6-1587, FAA Approved Airplane Flight Manual, Boeing Model 707-300C Series, The Boeing Company, Renton, Washington, September 20, 1963, revised February 21, 1968.

4. Federal Aviation Regulations; Part 36 - Noise Standards: Aircraft Type Certification.

5.0 CHART READING PROCEDURE

The following section illustrates the proper use of the charts of Sections 6 and 7 to find the noise level contribution at a particular noise sensitive point under the approach or departure path of the aircraft.

The height of the aircraft following takeoff and climbout at any distance from brake release is found from the combination of distance to 35 ft. and climbout charts in Section 7. However, the BRGW used to enter these charts should be determined to be below the gross weight limits shown in Section 3.1 and also below the performance limits shown in the Flight Manuals (Ref. 1, 2, and 3) for those airport conditions.

Climbout speed is determined from the chart in Section 7.0 and, with the height determined above, is converted to true airspeed using the first chart in Section 6. Net takeoff thrust can be determined using the chart in Section 7 and corrected using page 6.3.

The aircraft height, corrected net thrust and true airspeed calculated above constitute the aerodynamic performance necessary to determine the noise. The appropriate generalized noise chart in Section 7 is entered with these parameters to determine the noise at reference conditions. This noise level is then corrected to the actual conditions using the charts in Section 6.

If a thrust cutback procedure was initiated for noise abatement purposes the height is adjusted using page 6.5. The cutback should be initiated .3 nautical miles (1823 feet) prior to the start of the noise sensitive region to allow for engine spindown. Thrust may be reduced based on flying a constant gradient, rate of climb, or EPR. For constant gradient the thrust may be determined using the appropriate chart in Section 7. If a constant rate of climb cutback is selected, it is converted to gradient using page 6.5. If a constant EPR cutback is selected, its corresponding corrected net thrust is first determined using the chart in Section 7 and then converted to gradient, using the cutback thrust charts in Section 7.

Noise at any point under the approach path is found by first determining the height from page 6.6. The speed for the given flap and gross weight and the thrust required is obtained from Section 7. The speed and thrust required are then converted to true airspeed and corrected net thrust using pages 6.2 and 6.3.

All airplane performance can be corrected for winds. However, the noise data of Section 7 were measured in calm air, and no corrections to this data for wind

are included. For takeoff and climbout, wind corrections are shown on the charts in Section 7. For cutback, an additional wind correction to the height attained during cutback is made by use of page 6.7. For approach, wind affects the thrust required and can be accounted for using page 6.8 prior to determining the thrust required.

5.1 CHART READING EXAMPLE FOR TAKEOFF NOISE

707-300B Adv./C JT3D-3B Baseline Engines

Step	PROCEDURE	SELECTED CONDITIONS	CALCULATED RESULTS
1.	For the given model, engine, flap, BRGW and the following airport conditions: Temperature Altitude Headwind Find on pg. 7.3.8 the equivalent BRGW and the all engine distance to a height of 35 ft.	14° 280,000 lb. 80°F 2000 ft. +15 kt	 284,500 lb. 6750 ft.
2.	Then for the above conditions, and the selected climbout speed, find the equivalent profile gross weight, from pg. 7.3.10. Using the same page, find the height at a selected distance from brake release 3.5x6076=21,266 ft. From 35 ft.: 21,266-6750=14,516 ft. The height at this equivalent profile weight and distance from 35 ft. height is	V_2+20 kt 3.5 n.mi.	 288,200 lb. 1450 ft.
3.	For the selected BRGW, flap, climbout speed increment and airport conditions find on pg. 7.3.1 the all engine climb-out speed.		175.2 KEAS
4.	Convert this equivalent airspeed to true airspeed with pg. 6.2 by entering with airport temperature and airplane altitude of 2000+1450=3450 ft.		189.5 KTAS
5.	On pg. 7.3.12 find the net takeoff thrust per engine of		12,990 lb.
6.	Convert to corrected net thrust (F_N/δ) using pg. 6.3.		14,750 lb.
7.	Find the noise under the flight path at reference conditions for a height of 1450 ft. and a corrected net thrust (F_N/δ) of 14,750 lb. EPNdB level is obtained from pg. 7.1.12 and dBA level is obtained from pg. 7.1.13.		Reference: 110.4 EPNdB 94.9 dBA

Step	PROCEDURE	SELECTED CONDITIONS	CALCULATED CALCULATED
8.	Find the corrections for actual conditions of 2000 ft. airport altitude and 80°F airport temperature from pg. 6.9. For EPNdB an additional correction is needed for a true airspeed of 189.5 KTAS. This correction is found on pg. 6.10. These corrections are added to the reference values to give actual flight path noise.		Corrections: -.3 ▲ EPNdB -.3 ▲ dBA -.7 ▲ EPNdB Total: 109.4 EPNdB 94.6 dBA

5.2 CHART READING EXAMPLE FOR CUTBACK NOISE

707-300B Adv./C JT3D-3B Baseline Engines

Step	PROCEDURE	SELECTED CONDITIONS	CALCULATED RESULTS
1.	Steps 1 through 4 of the takeoff analysis are unchanged except step 2 is modified in step 5 below.		
2.	For cutback to a constant rate of climb, use pg. 6.4 to find the cutback gradient for a true airspeed of 189.5 KTAS.	800 fpm	4.16%
3.	With the RSGW, gradient, flap, and climbout speed use pg. 7.3.2 to find the net thrust required.		8790 lb.
4.	With the true airspeed, the headwind and the cutback gradient, use pg. 6.7 to find the wind corrected cutback gradient.		4.52%
5.	Find the height above the runway at the cutback initiation point .3n.mi. prior to the noise measuring point. Enter pg. 7.3.10 with the equivalent profile gross weight of 288,200 lb. and at a distance of 14,516 - (.3) x 6076 = 12693 ft. from the 35 ft. height.		1250 ft.
6.	Find the incremental height gained during cutback by entering pg. 6.5 with the corrected gradient and the distance of 1823 ft. Add this to the height at cutback initiation to find the height at the noise sensitive point.		82 ft. 1332 ft.
7.	Convert the net thrust to corrected net thrust using pg. 6.3.		9930 lb.
8.	The engine pressure ratio (EPR) may be found on pg. 7.3.13 for the conditions of corrected net thrust, altitude, and equivalent airspeed.		1.488
9.	Find the noise under the flight path at Reference conditions for a height of 1332 ft. and at corrected net thrust of 9930 lb. EPNdB level is found on pg. 7.1.12 and dBA level is found on pg. 7.1.13.		Reference: 109.1 EPNdB 93.2 dBA

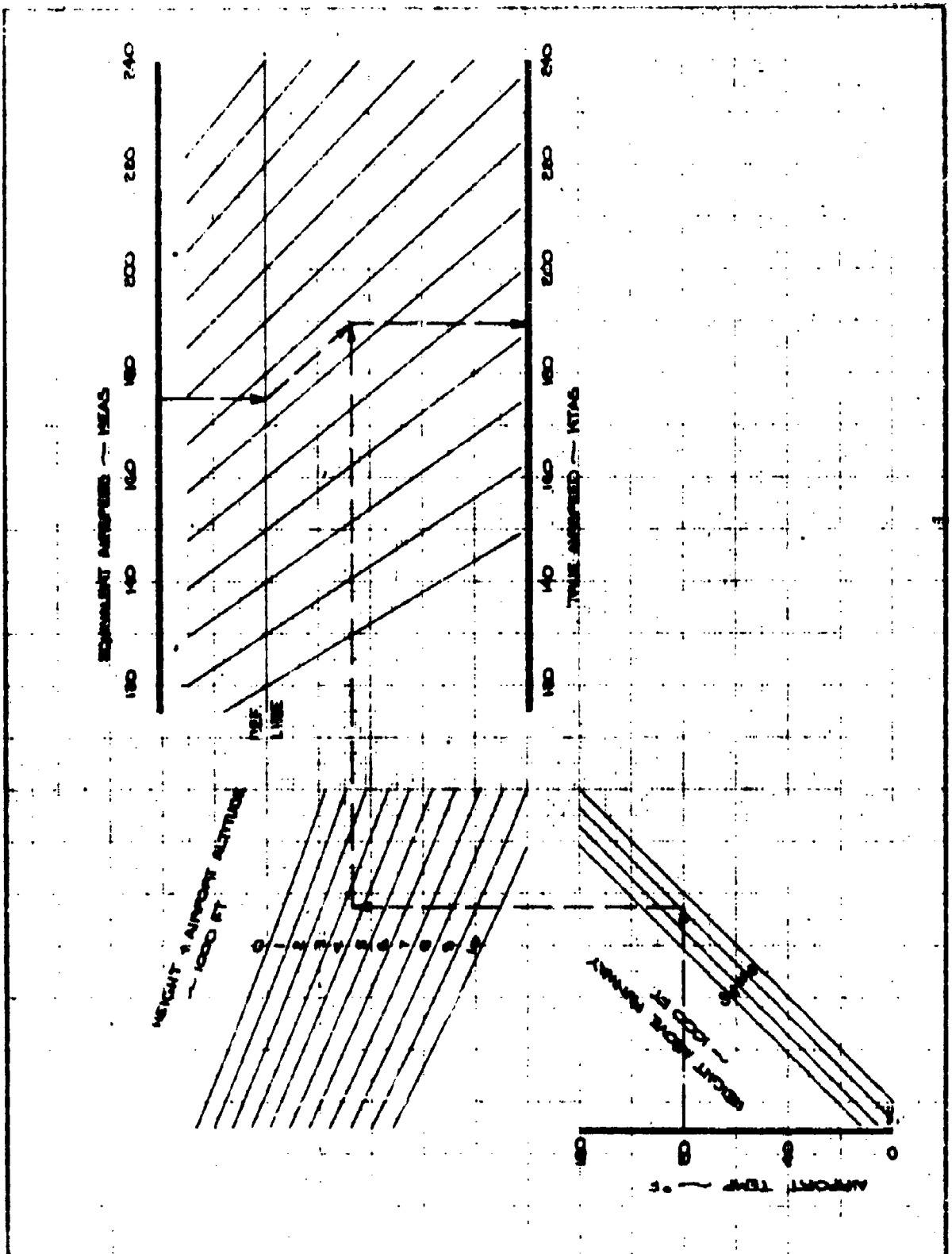
Step	PROCEDURE	SELECTED CONDITIONS	CALCULATED RESULTS
10.	Correct to the actual conditions as in step 8 of the takeoff case.		Totals: 108.1 EPNdB 92.9 dBA

5.3 CHART READING EXAMPLE FOR APPROACH NOISE

707-300B Adv./C JT3D-3B Baseline Engines

Step	PROCEDURE	SELECTED CONDITIONS	CALCULATED RESULTS
1.	Select a landing flap, gross weight and speed increment above the reference landing speed. Use pg. 7.3.3 to find the approach speed.	40° 200,000 lb. 20 kt.	 144.7 KEAS
2.	At the desired distance from the threshold and the selected glide slope angle, find the aircraft height. 2x6076 = 12,152 ft. Enter pg. 6.6 to determine the height.	2.0 n.mi. 3.0°	 683 ft.
3.	Assuming the same airport conditions as for takeoff, determine true airspeed from pg. 6.2.	2000 ft. 80°F	 154.9 KTAS
4.	For the airport headwind, true airspeed, and intended glide slope, use pg. 6.8 to find the wind corrected glide slope	+15 kt.	 2.72°
5.	Using the wind corrected glide slope and the true airspeed find the rate of descent on pg. 6.4.		 740 fpm
6.	Use the gross weight, flap setting, and wind corrected glide slope to find the net thrust on pg. 7.3.6.		 4630 lb.
7.	Convert to corrected net thrust using pg. 6.3.		 5110 lb.
8.	Find the noise under the flight path at reference conditions for a height of 683 ft. and a corrected net thrust of 5070 lb. EPNdB level is obtained from pg. 7.1.12 and dBA level is obtained from pg. 7.1.13.		References: 110.5 EPNdB 99.3 dBA Corrections: -.3 Δ EPNdB -.3 Δ dBA +.1 Δ EPNdB Totals: 110.3 EPNdB 99.0 dBA
9.	Correct to actual conditions as in step 8 of the takeoff case except the EPNdB velocity correction of pg. 6.10 is now based on 154.9 KTAS.		

6.0 PERFORMANCE CHARTS COMMON TO ALL AIRCRAFT



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CONVERSION CHART — 707

EQUIVALENT TO TRUE AIRSPEED — D6-42141-1

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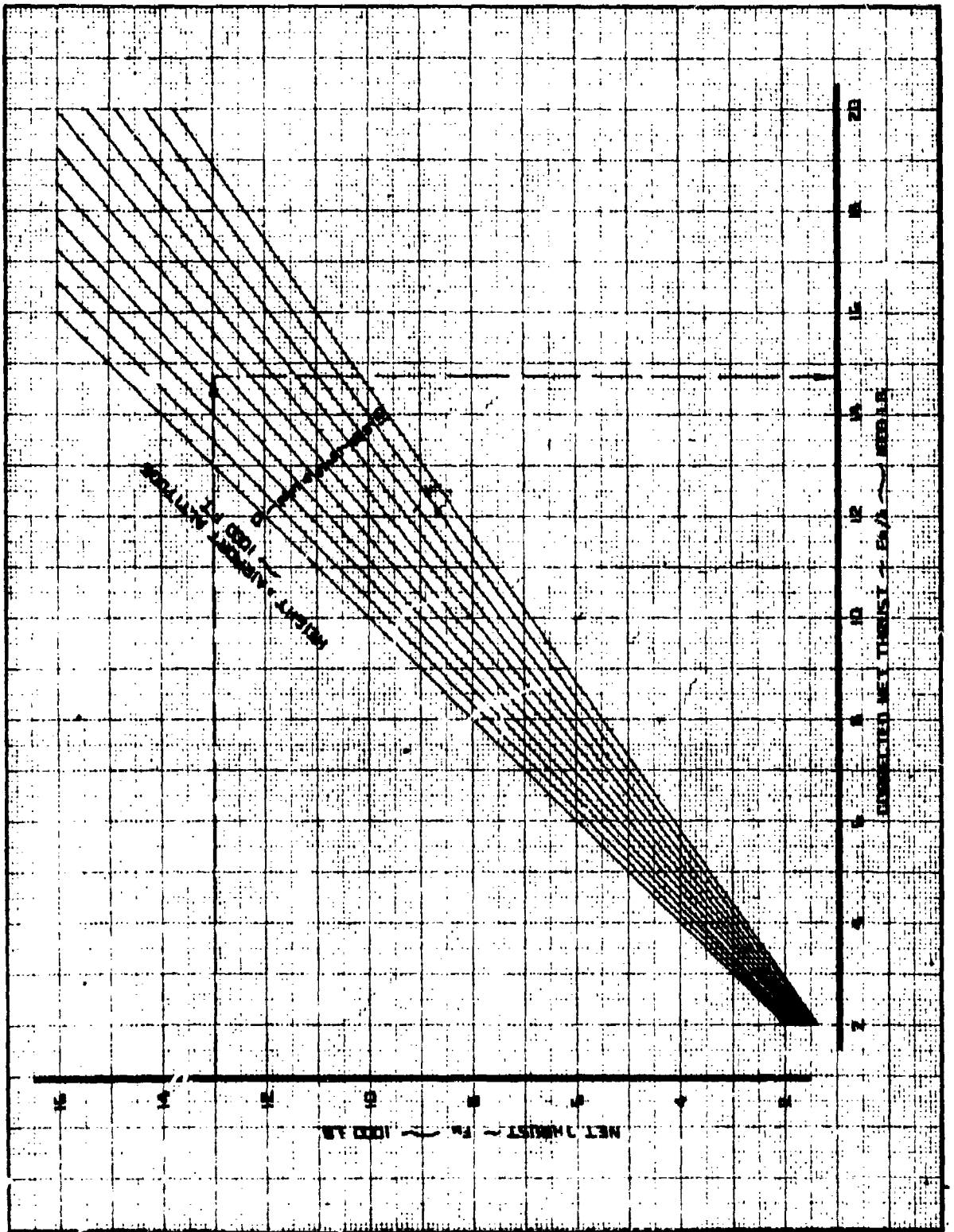

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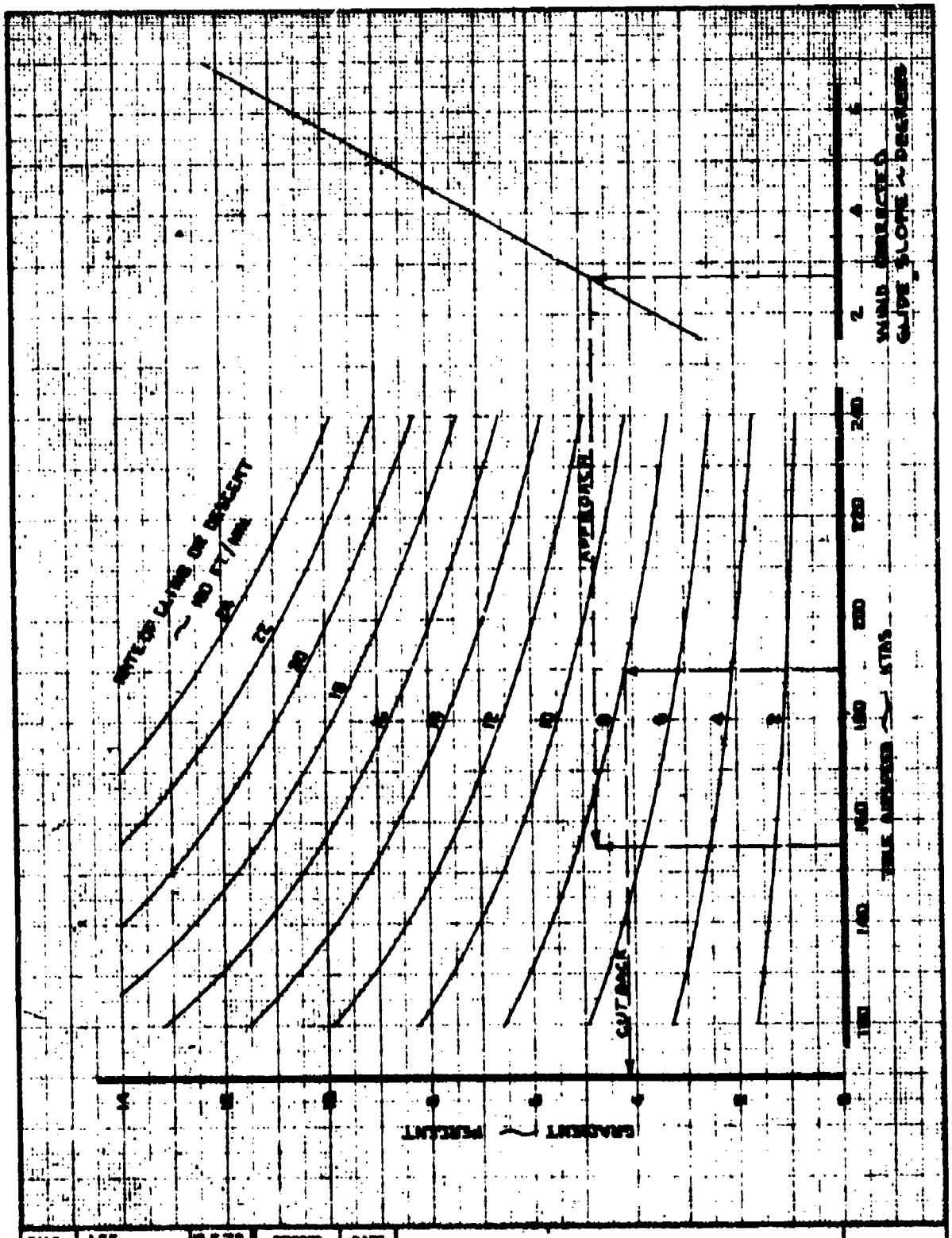

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CONVERSION CHART
RATE OF CLIMB TO GRADIENT AND
RATE OF DESCENT TO GLIDE SLOPE
(WIND CORRECTED)

707

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PAGE 6.4

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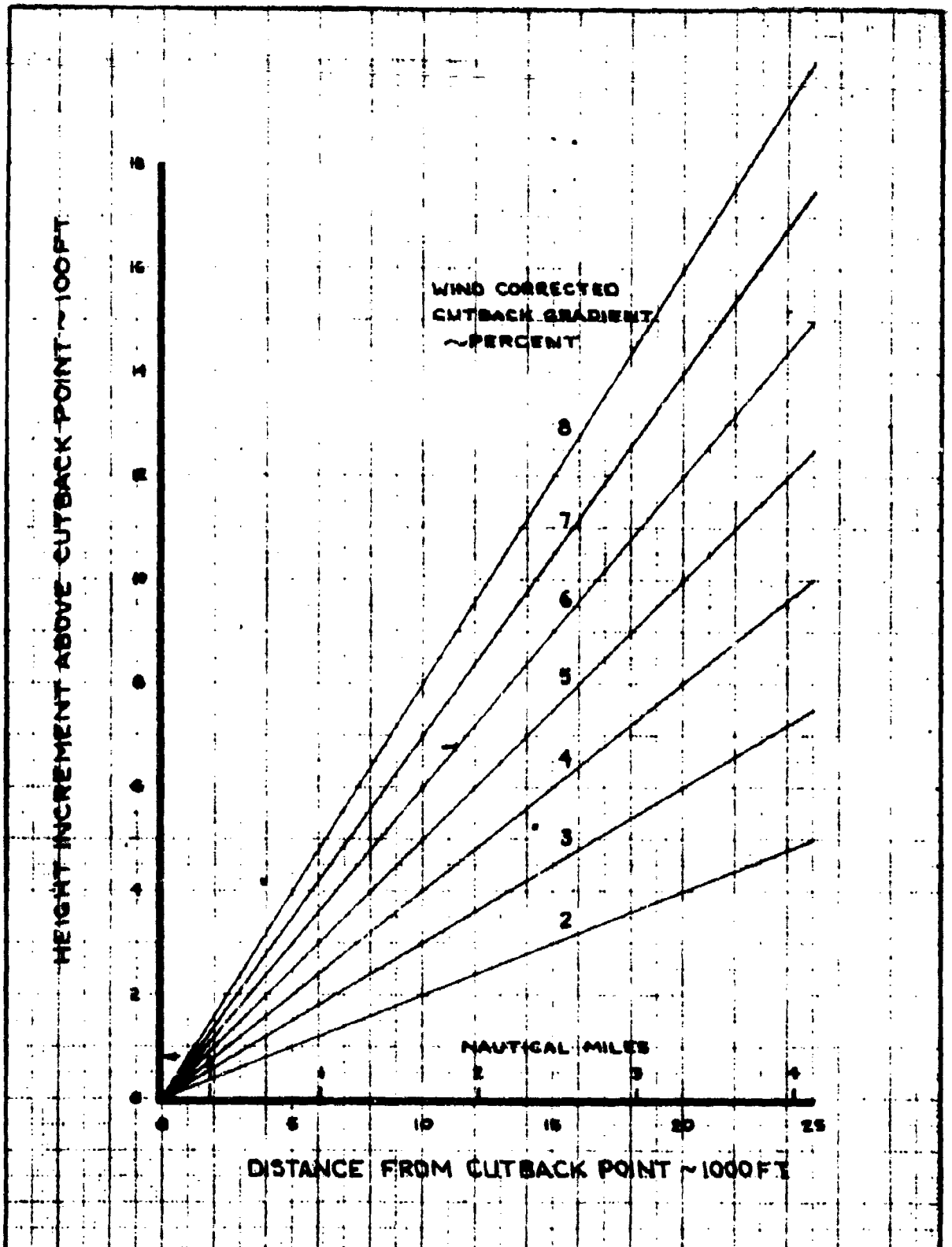

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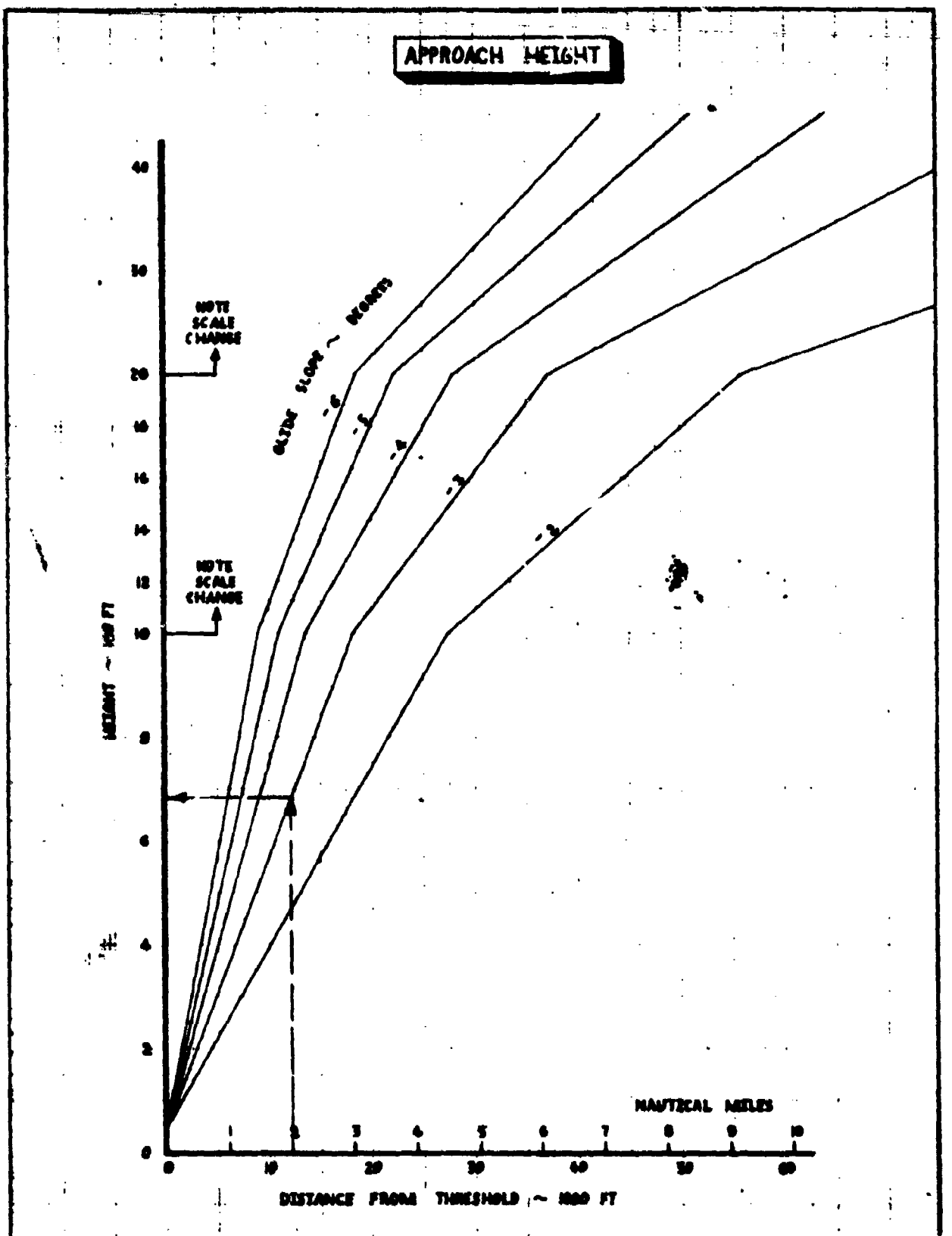

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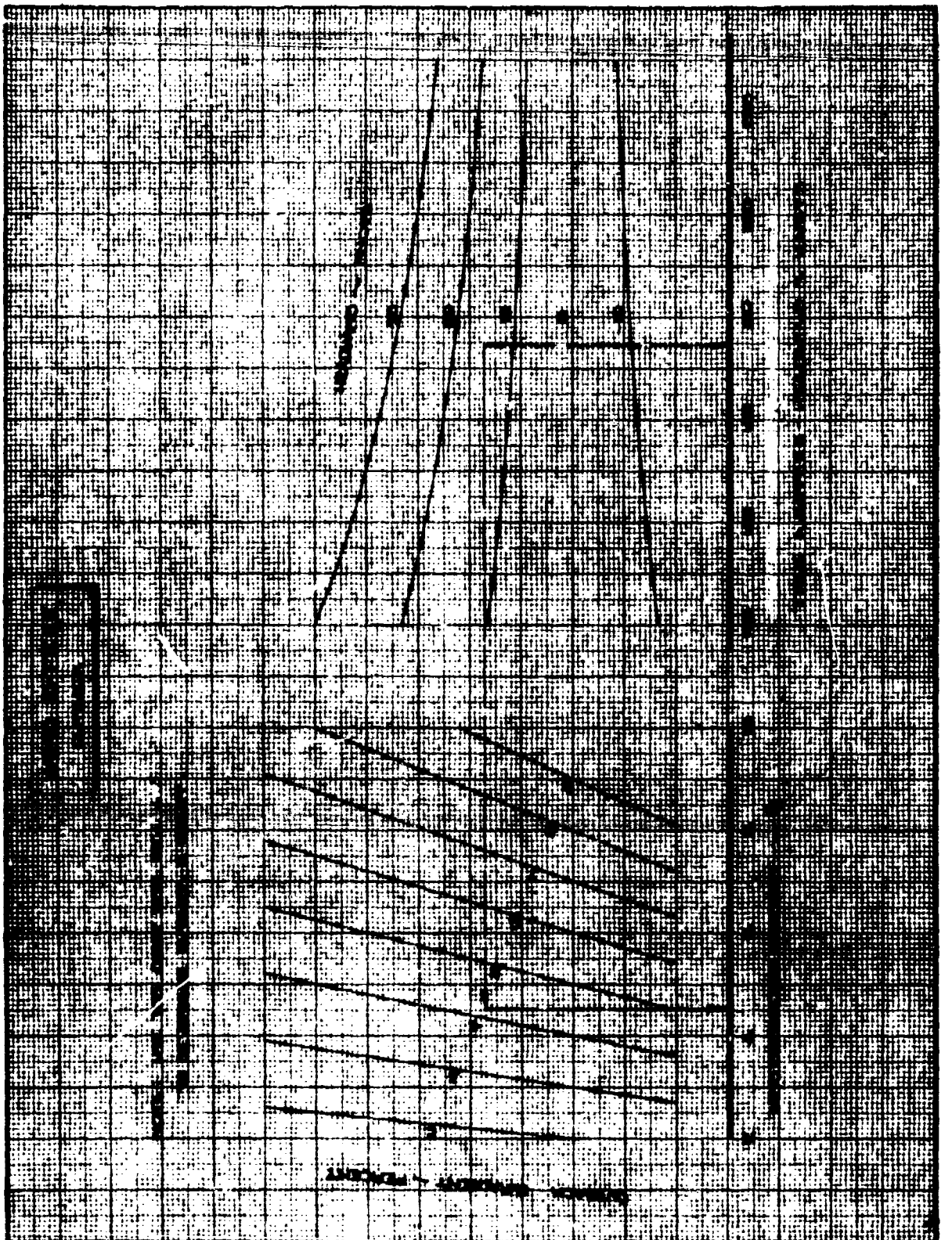
PLOT	W. G. BROOKS	8/22/73				

D1 4100 3260



CALC	LEE	5-25-72	REVISED	DATE	WIND EFFECT	707
CHECK	ANDERSON	5-28-72	SERENI	11/17/72		
APR					CUTBACK	D6-42161-1
APR						
INH	PELTES				THE BOEING COMPANY	PAGE 67

CALC							
CHECK							
APP							
APP							

FEL/TEB				
APPROVED				
REVISED				
DATE				

THE BOEING COMPANY

WIND EFFECT
APPROACH

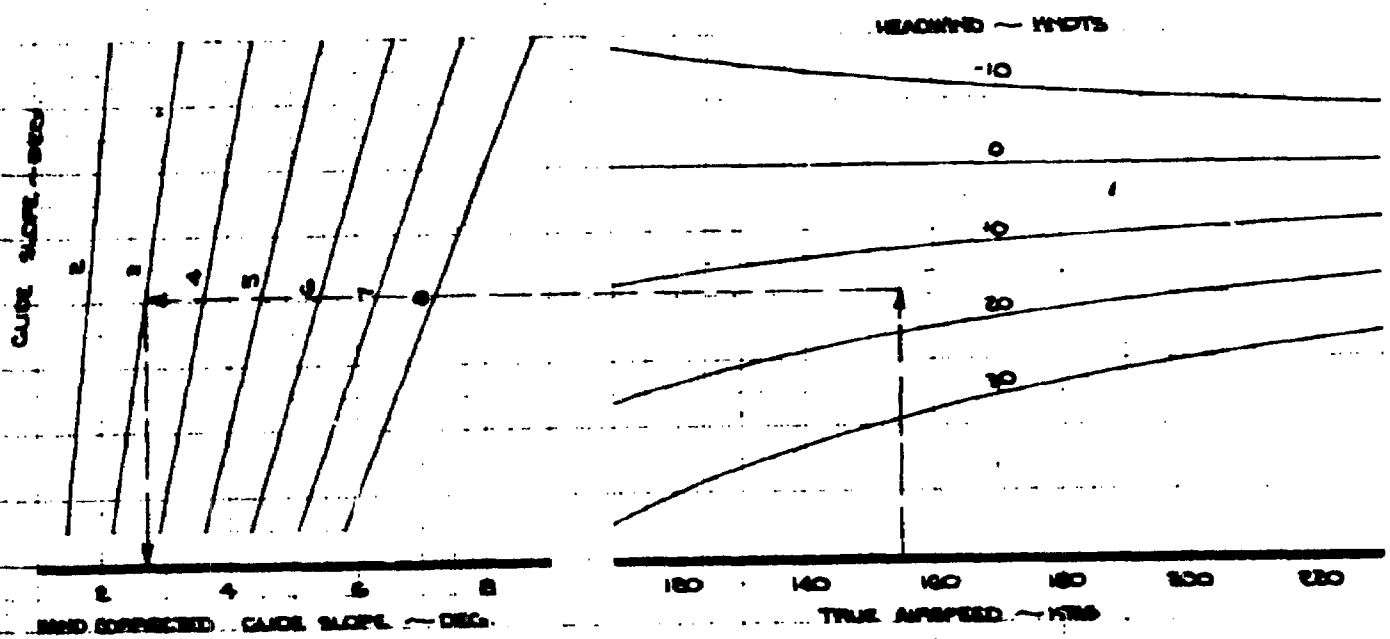
707

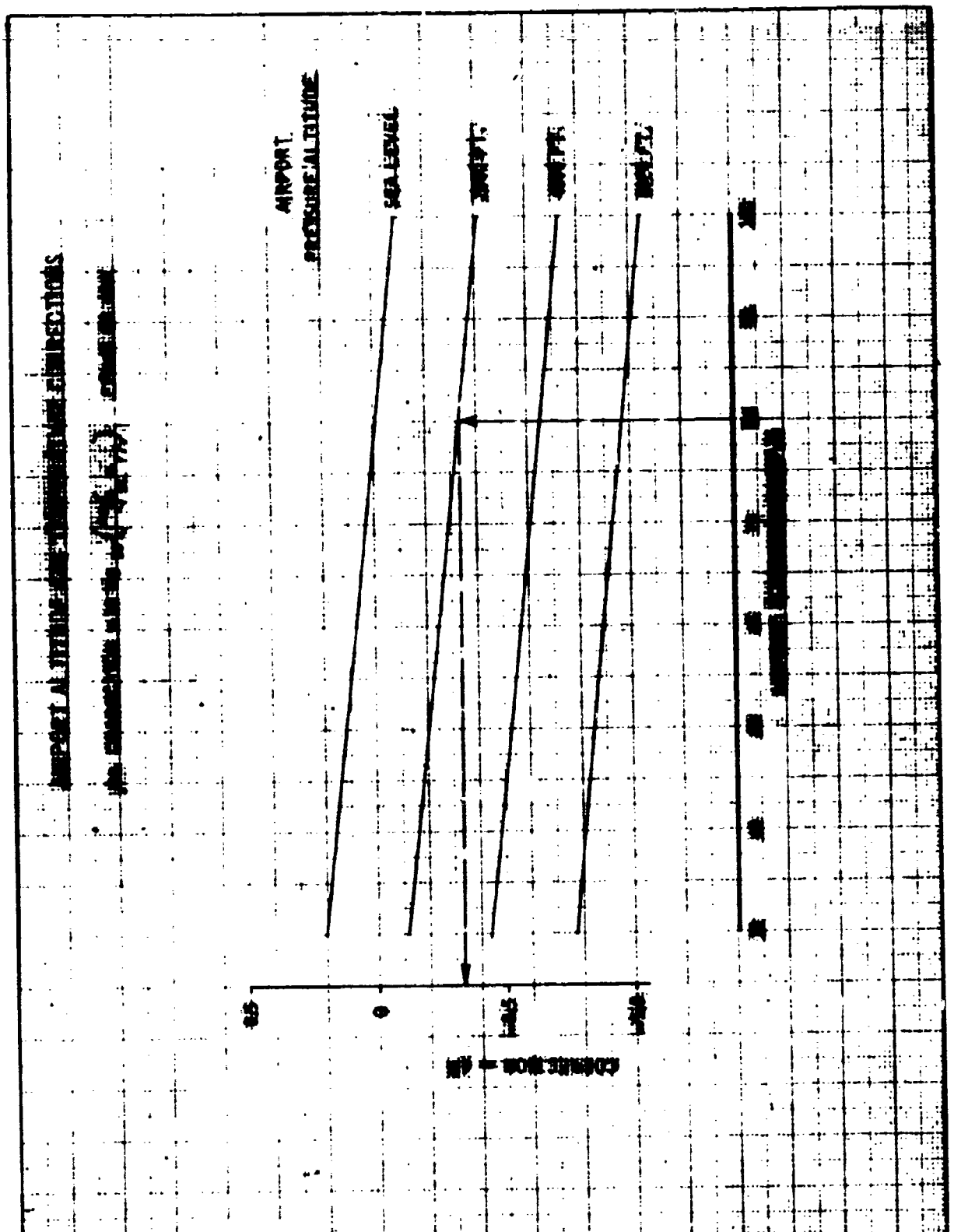
DC-4214-1

PAGE 6.8

WIND EFFECT
APPROACH

NOTE: USE THIS CHART WITH RECT. T.1.4, .5, .6, .7, T.2.6, .7, .8, .9, T.3.4, .5, .6, or .7 TO DETERMINE APPROACH THRUST





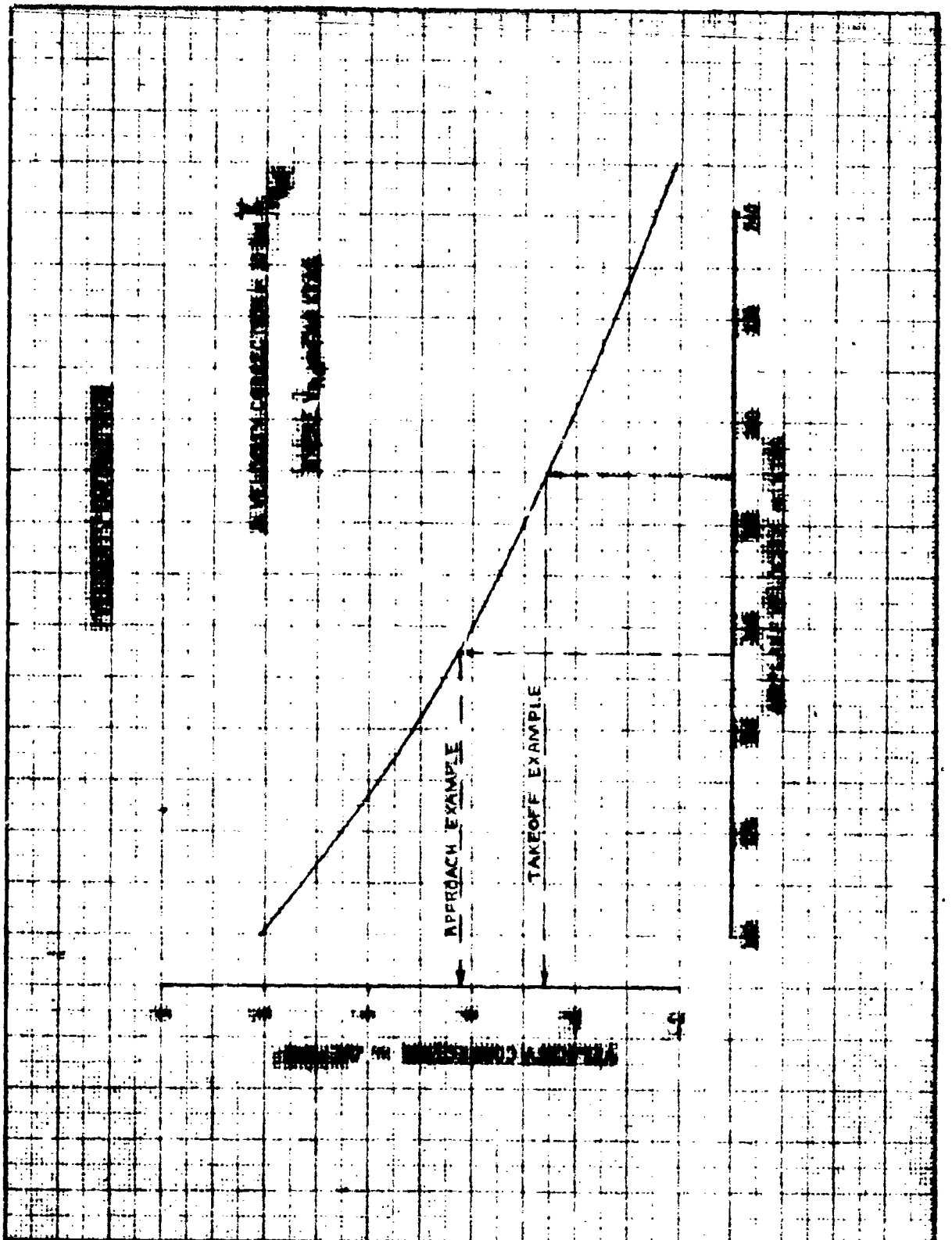
CALC	R. Yates	9/19/72	REVISED	DATE	AIRPORT ALTITUDE AND TEMPERATURE CORRECTIONS TO EPNdB AND dBA
CHECK					
APR					
APR					

707

D6-42141-1

THE BOEING COMPANY

PAGE 6.9



CALC			REVISED	DATE	VELOCITY CORRECTIONS TO EPNdB
CHECK					
APR					
APR					
					THE BOEING COMPANY

707

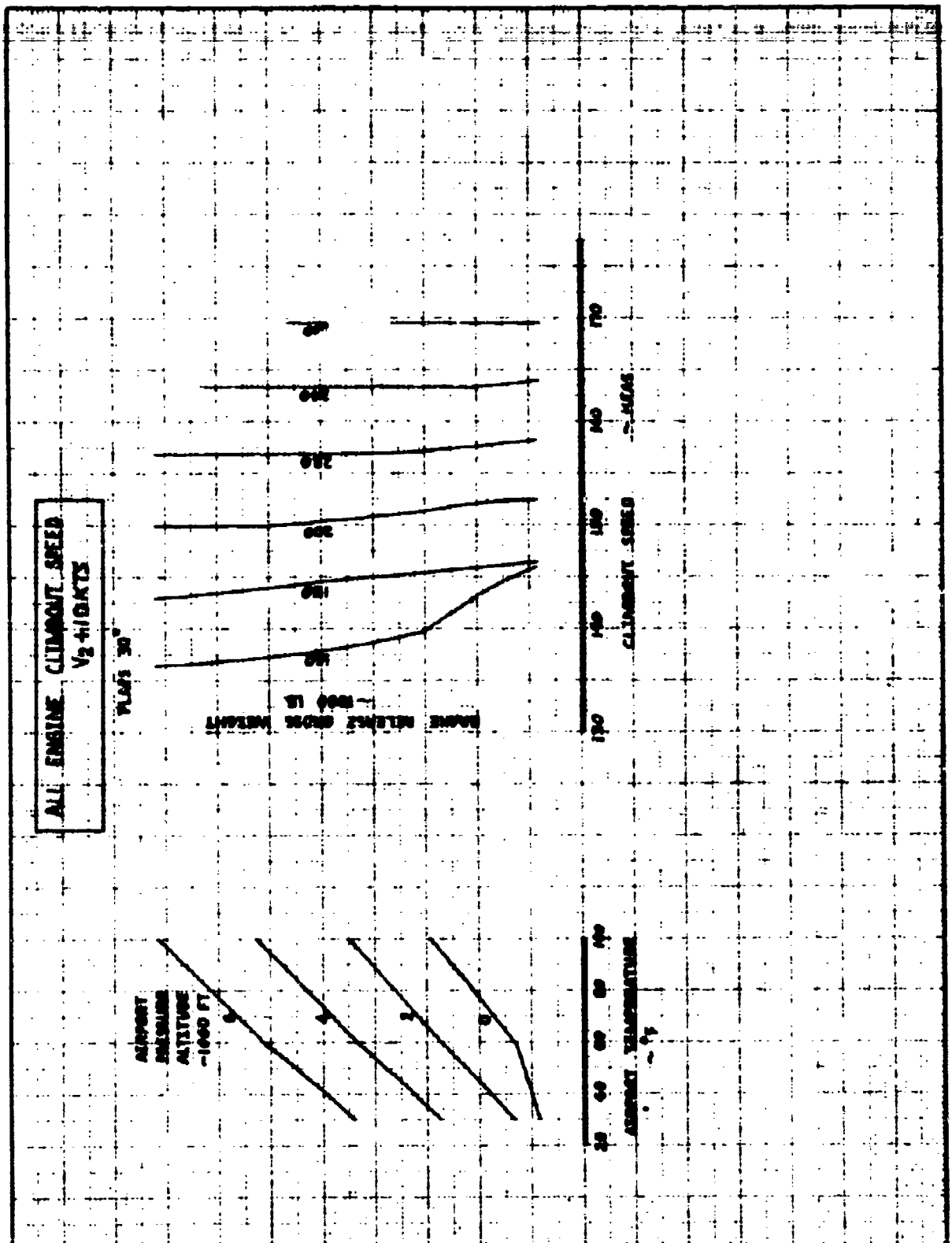
DG 42141-1

PAGE 6.10

DI 6100 3240

7.0 PERFORMANCE AND NOISE CHARTS FOR 707 TYPE MODELS

7.1 707-120B Aircraft with JT3D-3 Engines



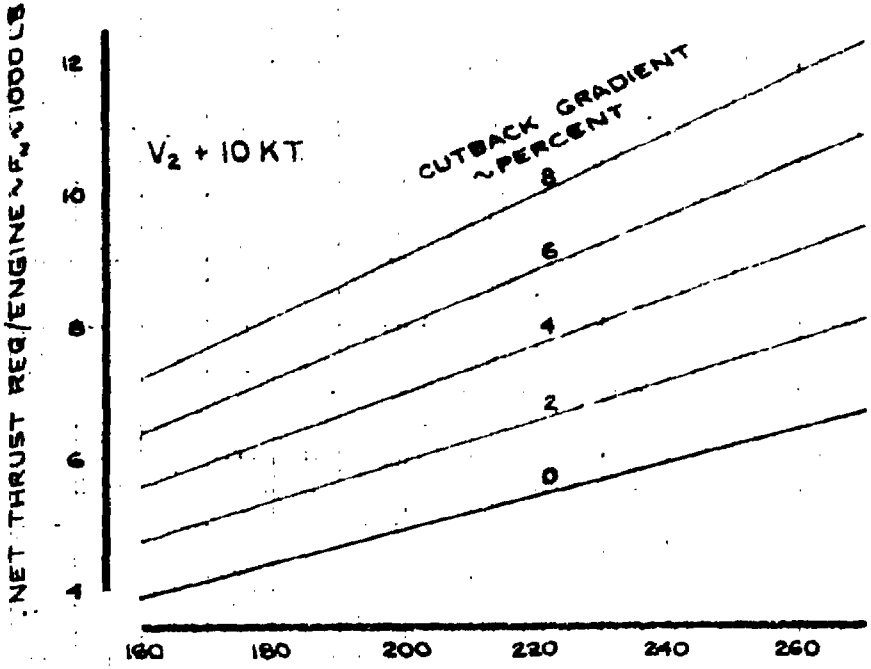
CALC	R.E. Bonilla	9-8-73	REVISED	DATE	ALL ENGINE CLIMBOUT SPEED FLAPS 30° JT3D-3 ENGINES	707-120B
CHECK	LARSON	9.26.73				DG-42141-1
APR						
APR					THE BOEING COMPANY	PAGE 7.1.1
INH	W.G. BROOKS	9/10/73				

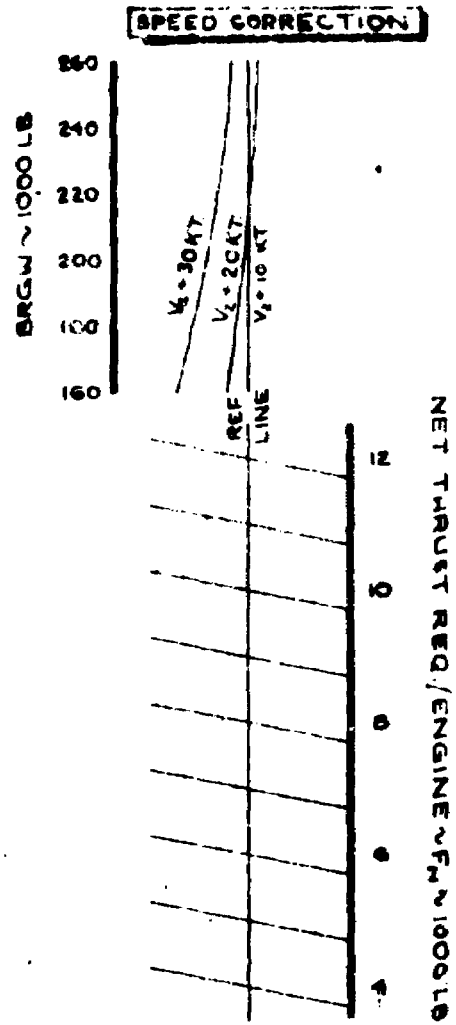
CUTBACK THRUST REQUIRED

FLAPS 30°

NOTES:

1. ALL ENGINES OPERATING
2. SEA LEVEL, 71°F BUT ACCURATE FOR ANY ALTITUDE AND TEMPERATURE TO WITHIN ± 50 LB. OF THRUST/ENGINE
3. FAR PART 36 MINIMUM THRUST REQUIRED IS THAT FOR A 4% GRADIENT





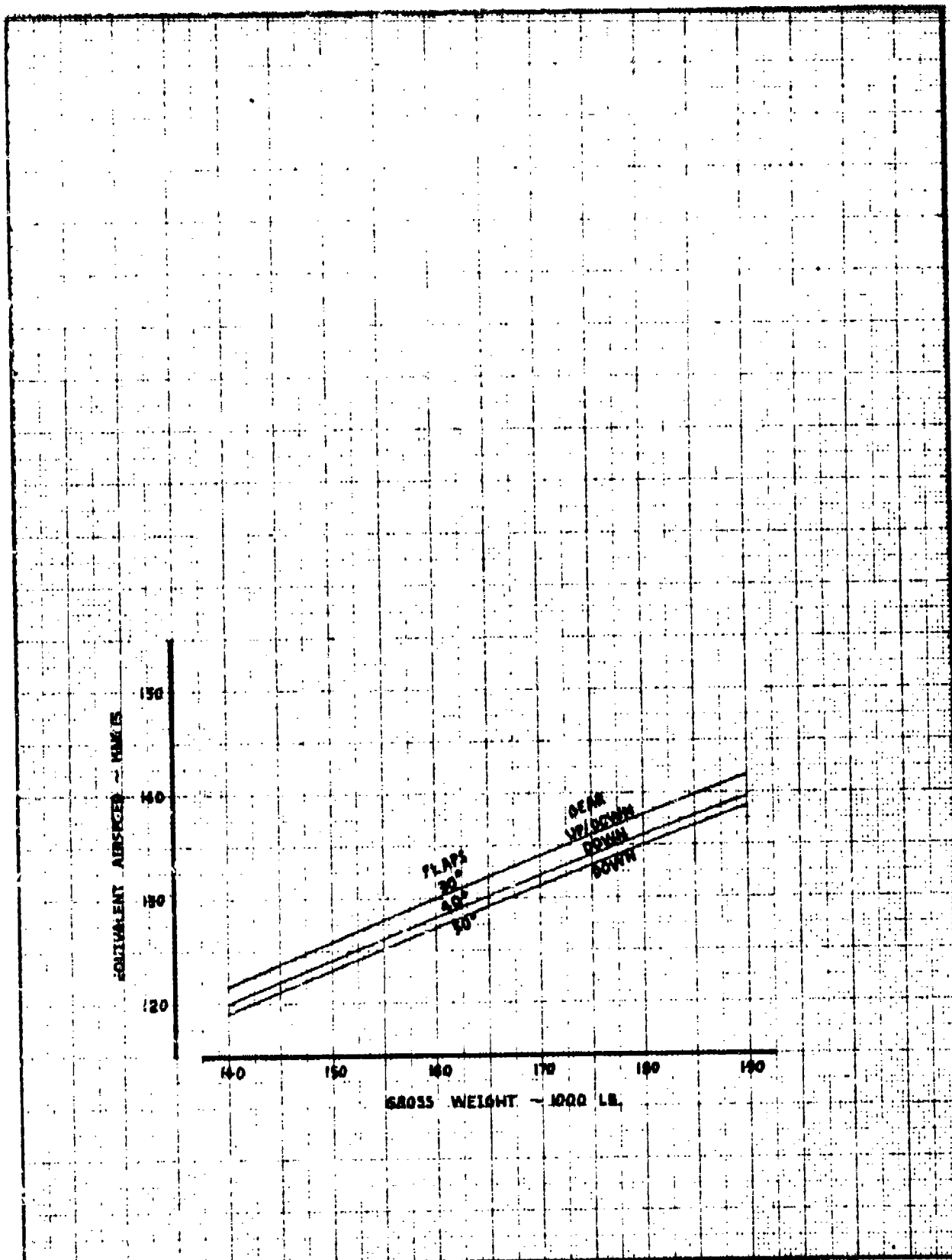
PLOT	SCHROETER 8-14-75	CALC	R. E. Buchholz 8-22-75		
		CHECK	LARSON 8-26-75	APPROVED	R. E. B. 11-19-75
				DATE	

CUTBACK THRUST REQUIRED

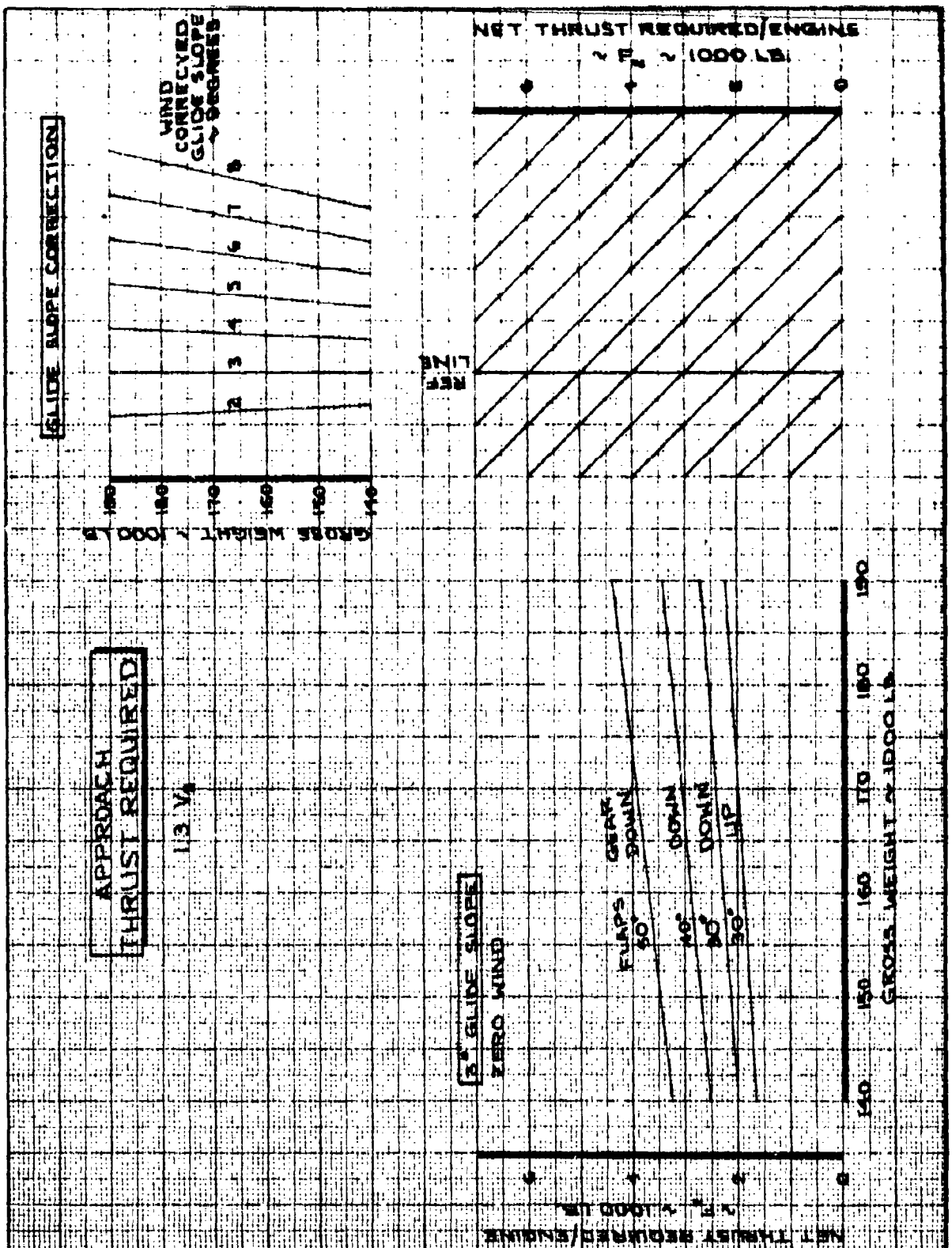
V_2 + 10 KT FLAPS 30°

THE BOEING COMPANY

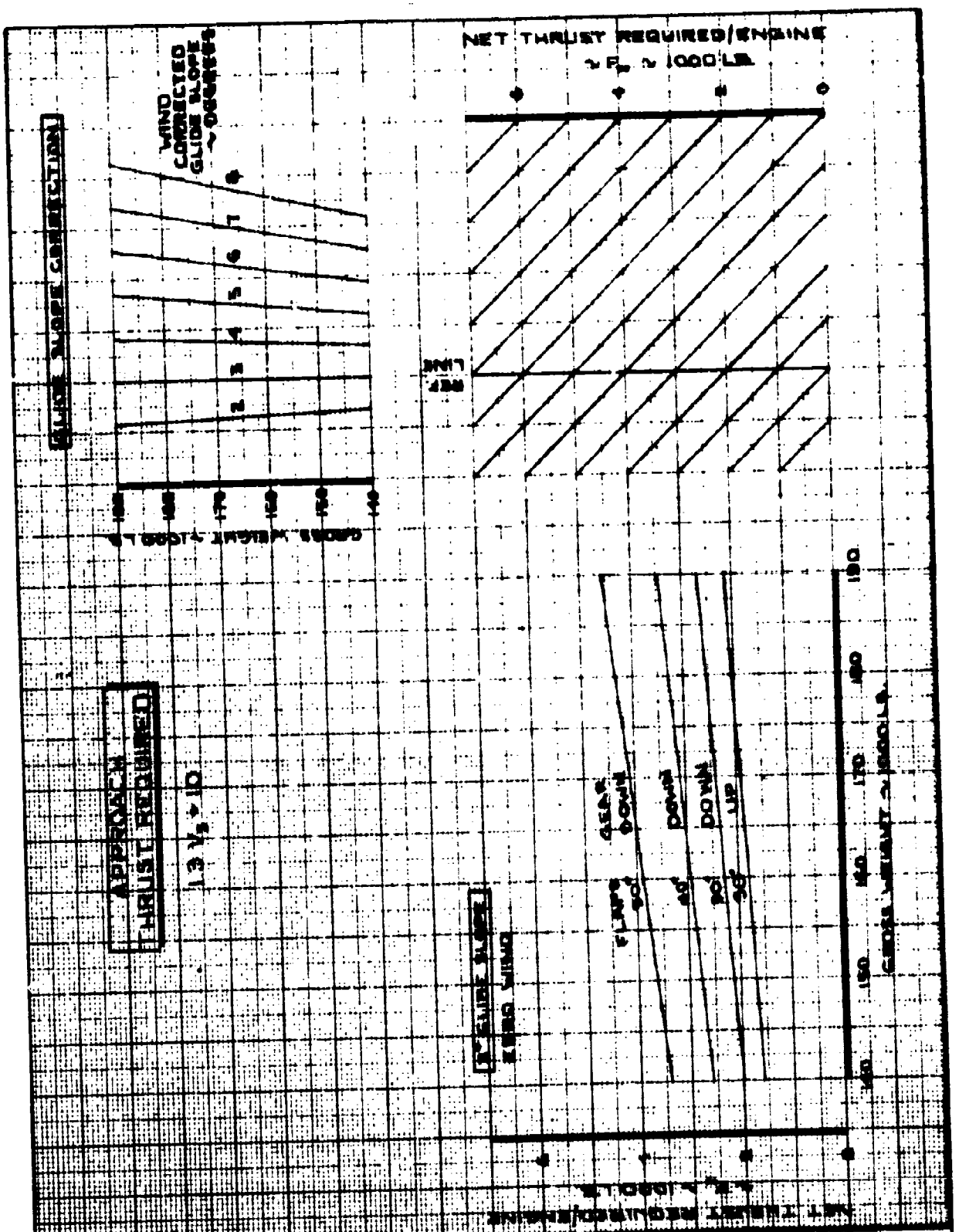
TOT-120B	
D6-42141-1	
PAGE 7.1.2	



CALC	R.E. Buckholz	9-10-73	REVISED	DATE	APPROACH SPEED 1.3 V_S	707-1208
CHECK	L. LARSON	9-25-73				D6-42141-1
APR						
APR					THE BOEING COMPANY	PAGE 7.1.3
ENR	W.G. BROOKS	9/11/73				

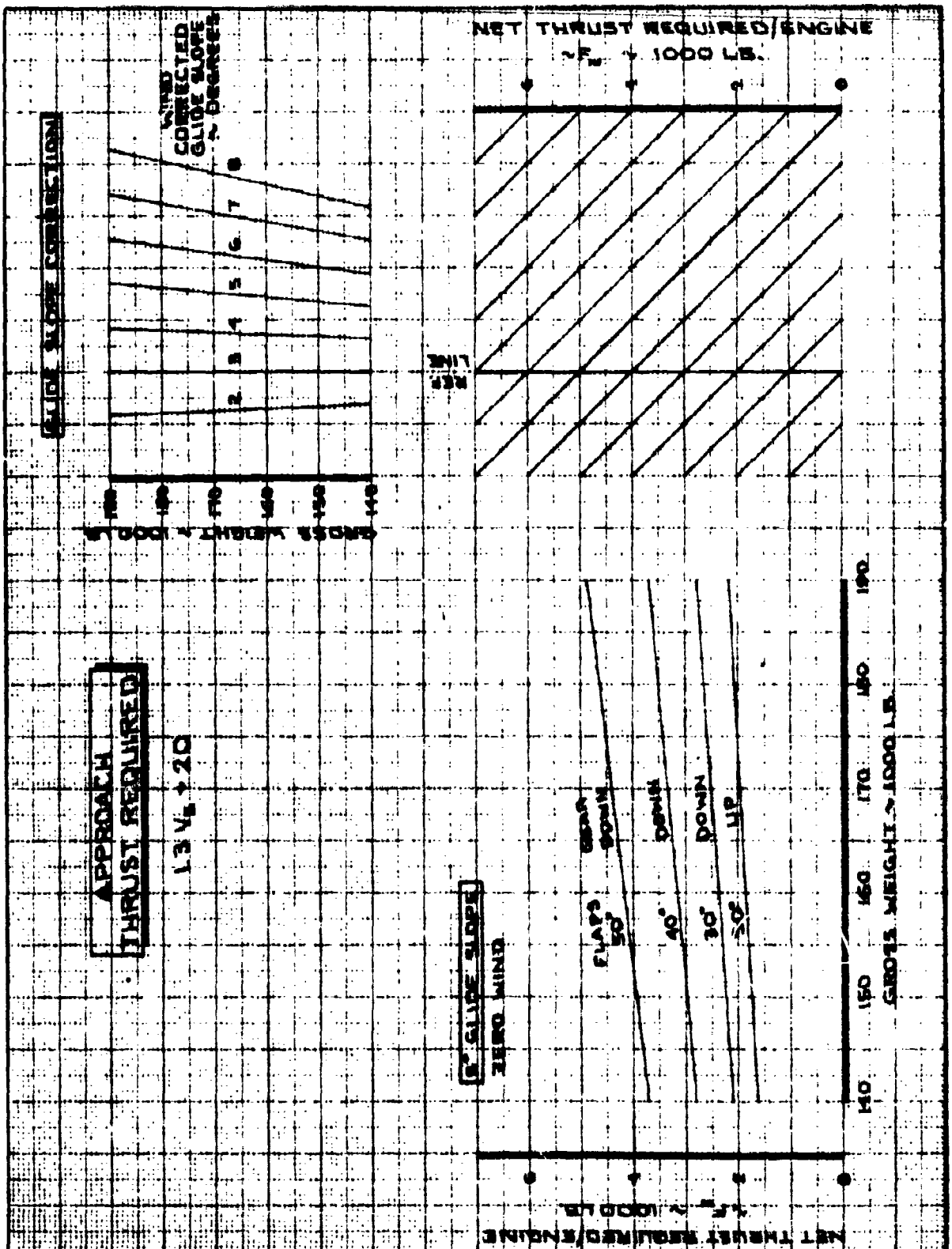


CALC	B.G. Williams	8-21-73	REVISED	DATE	APPROACH THRUST REQUIRED 707-1208
CHECK	FRAZER	9-21-73			1.3 V_S D6-42141-1
APR					THE BOEING COMPANY PAGE 7.1.4
APR					



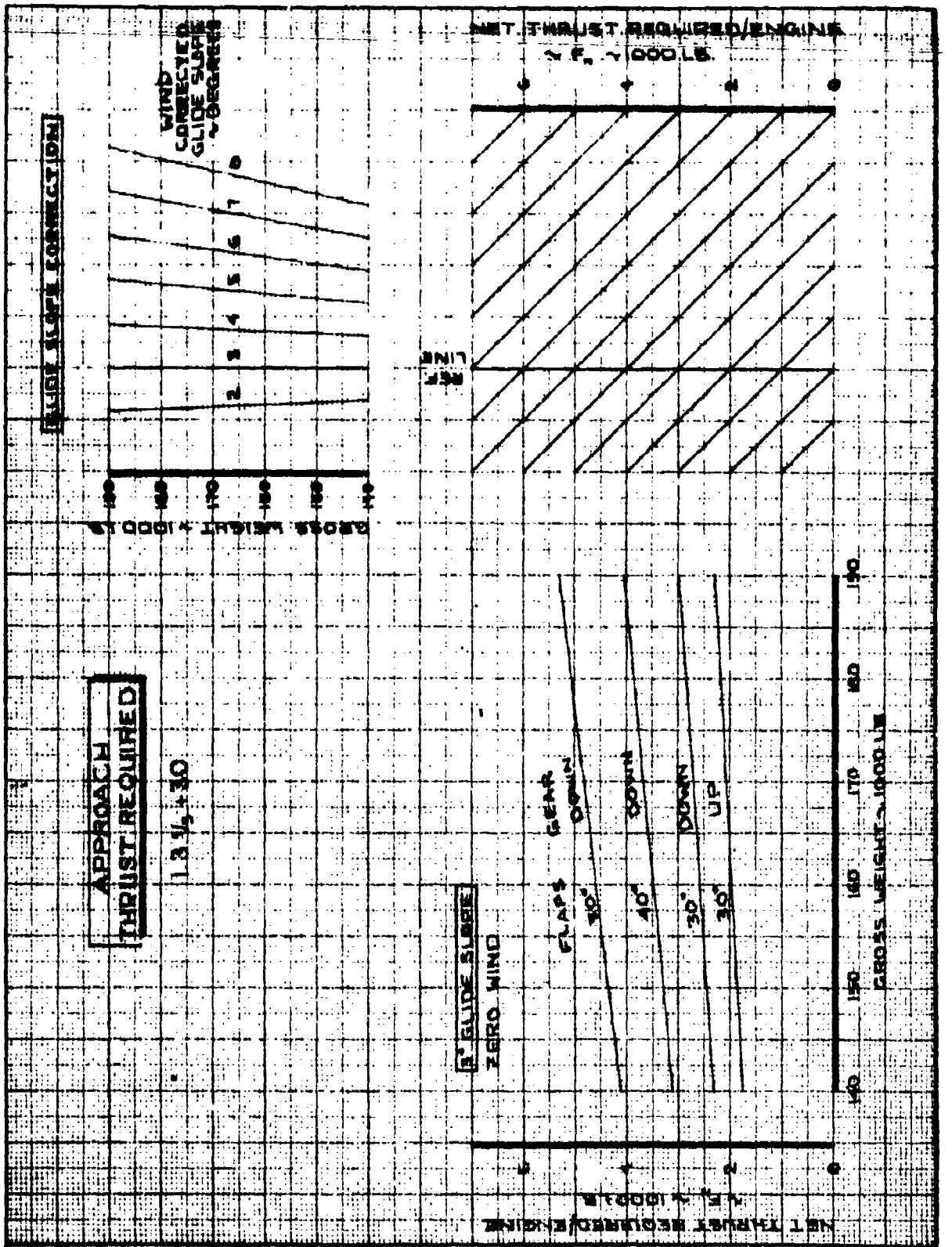
CALC	R.G. Williams	8.29.73	REVISED	DATE	APPROACH THRUST REQUIRED
CHECK	FRASER	9-29-73			13 V_S + 10
APR					THE BOEING COMPANY
APR					

707-1208
D6-42141-1
PAGE 7.1.5



CALC	B.G. Williams	8 29 73	REVISED	DATE	APPROACH THRUST REQUIRED
CHECK	FRASER	9-29-73			1.3 V_S + 20
APP					THE BOEING COMPANY
APP					

707-1208
D6-42141-1
PAGE 7.1.6



CALC	B.6 Williams	8.29.75	REVISED	DATE
CHECK	FRASER	9.29.75		
APR				
APR				

APPROACH THRUST REQUIRED

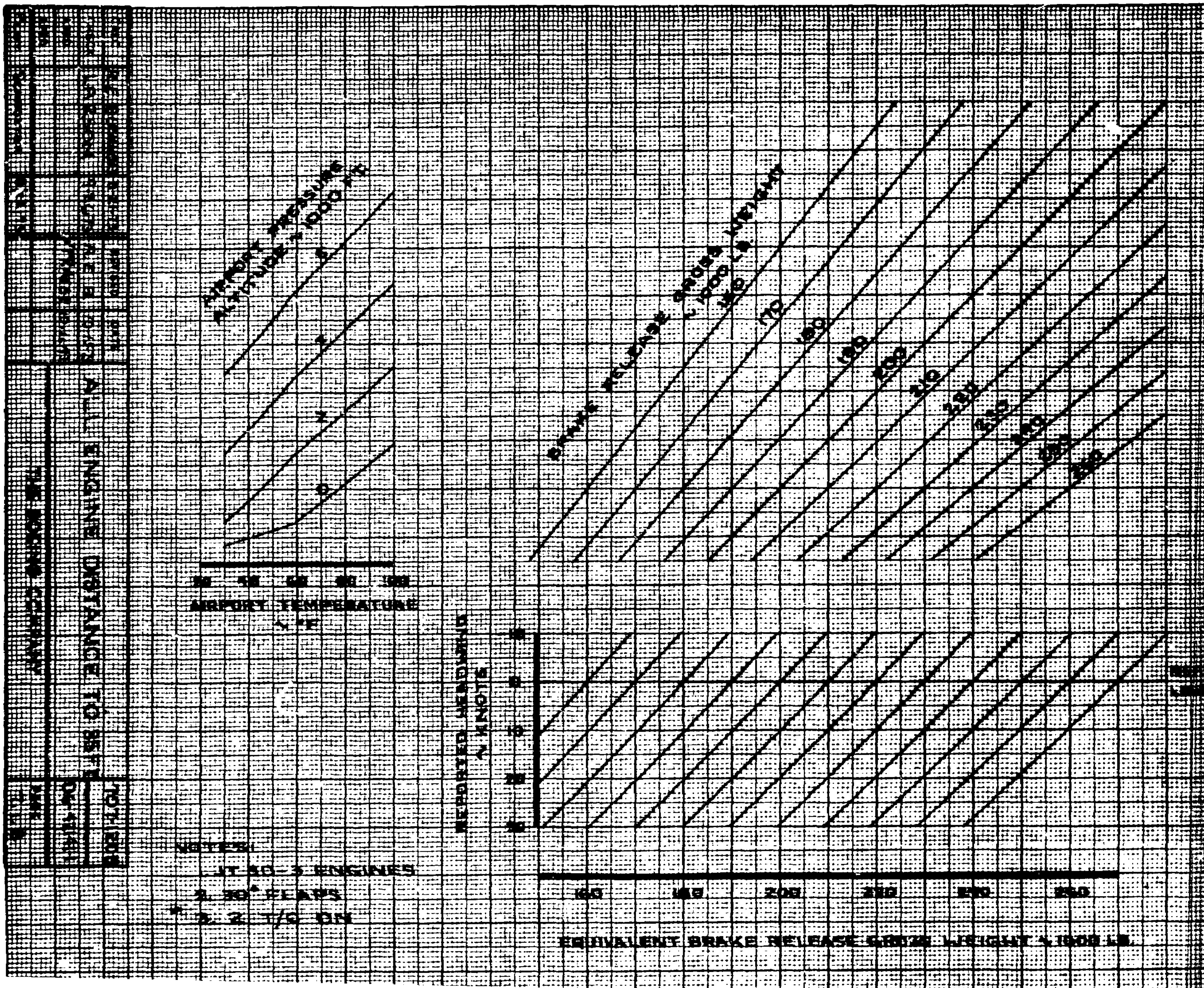
$1.3\,V_S + 30$

THE BOEING COMPANY

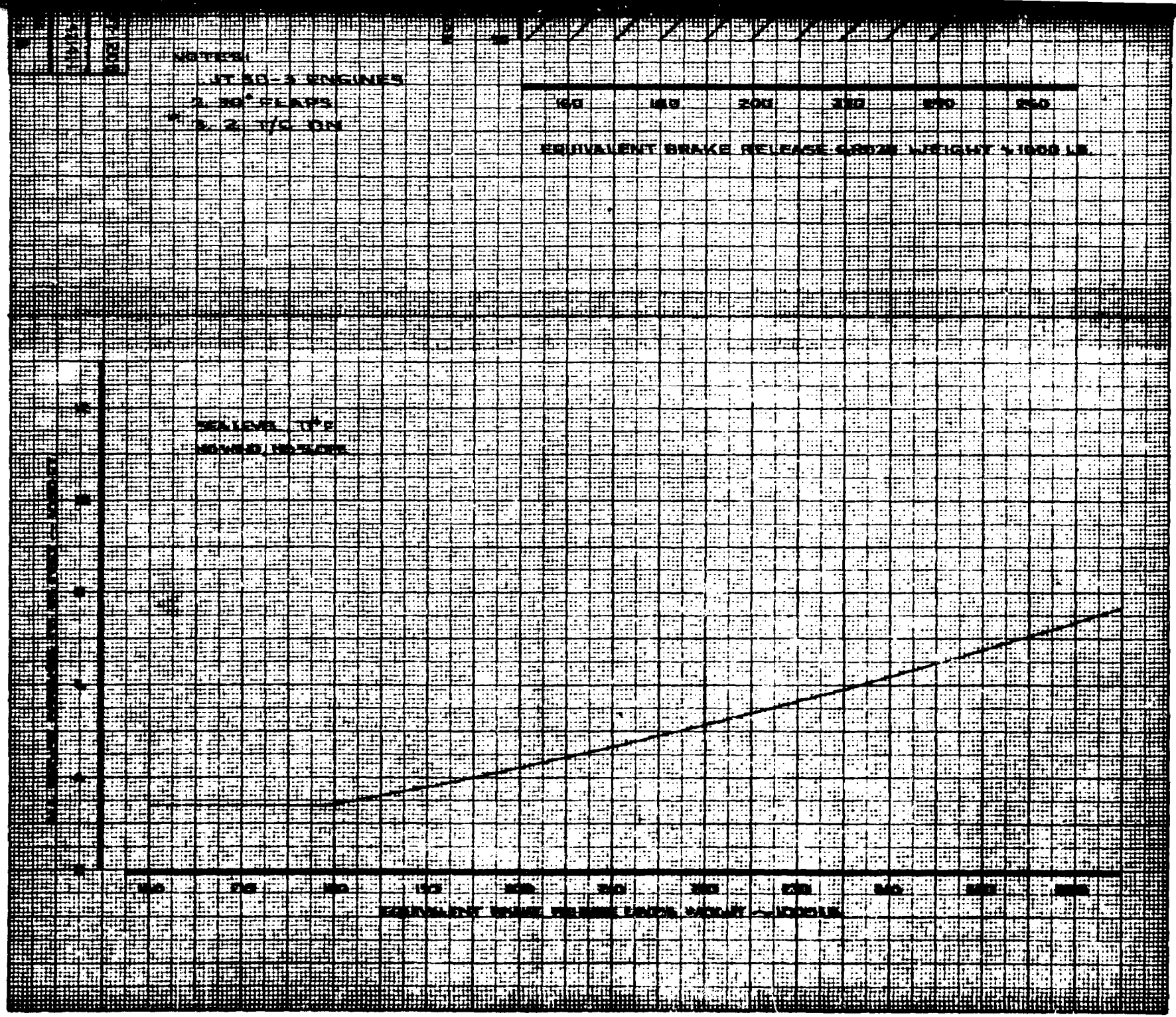
707-120 B

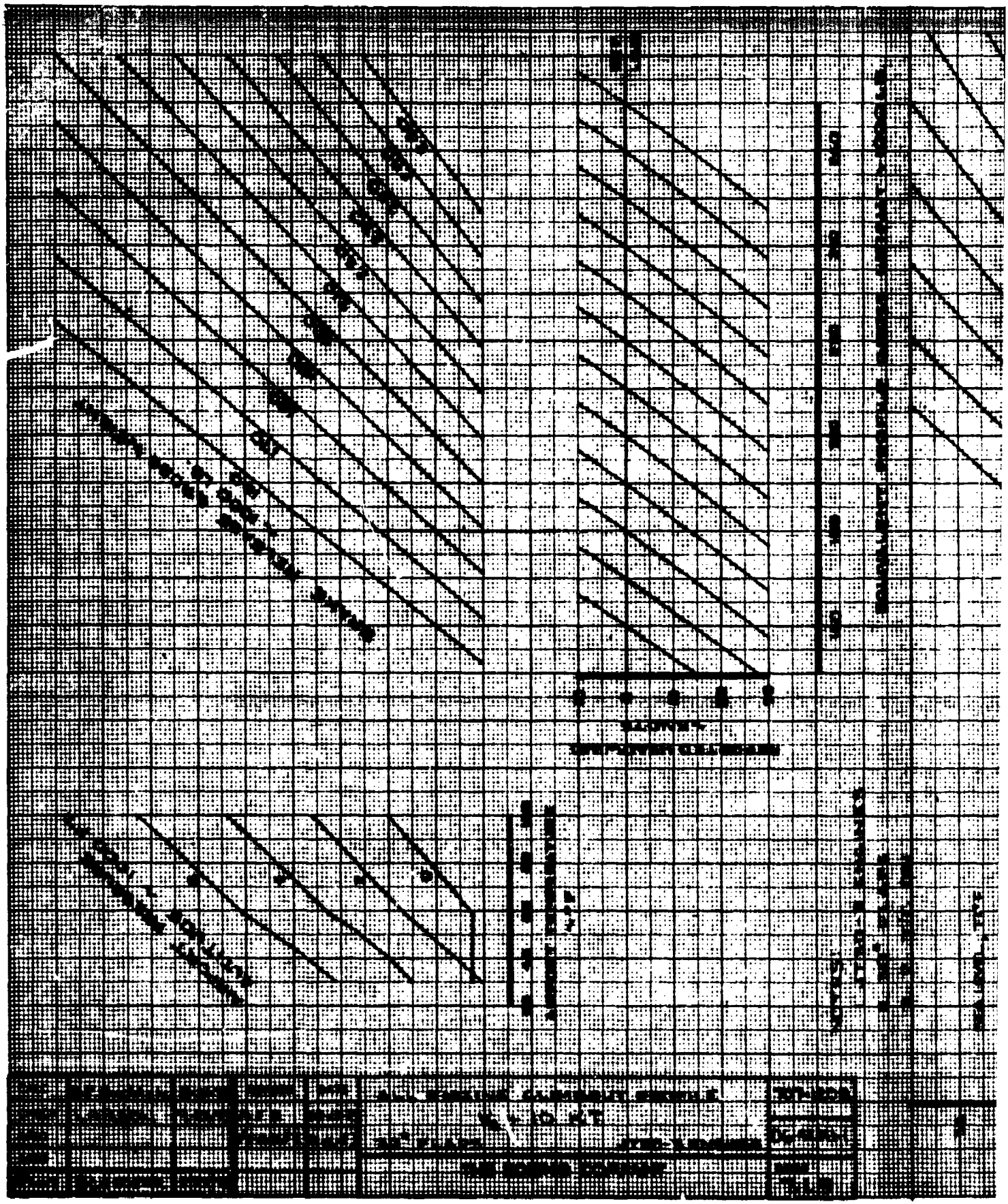
D6-42141-1

PAGE 7.1.7

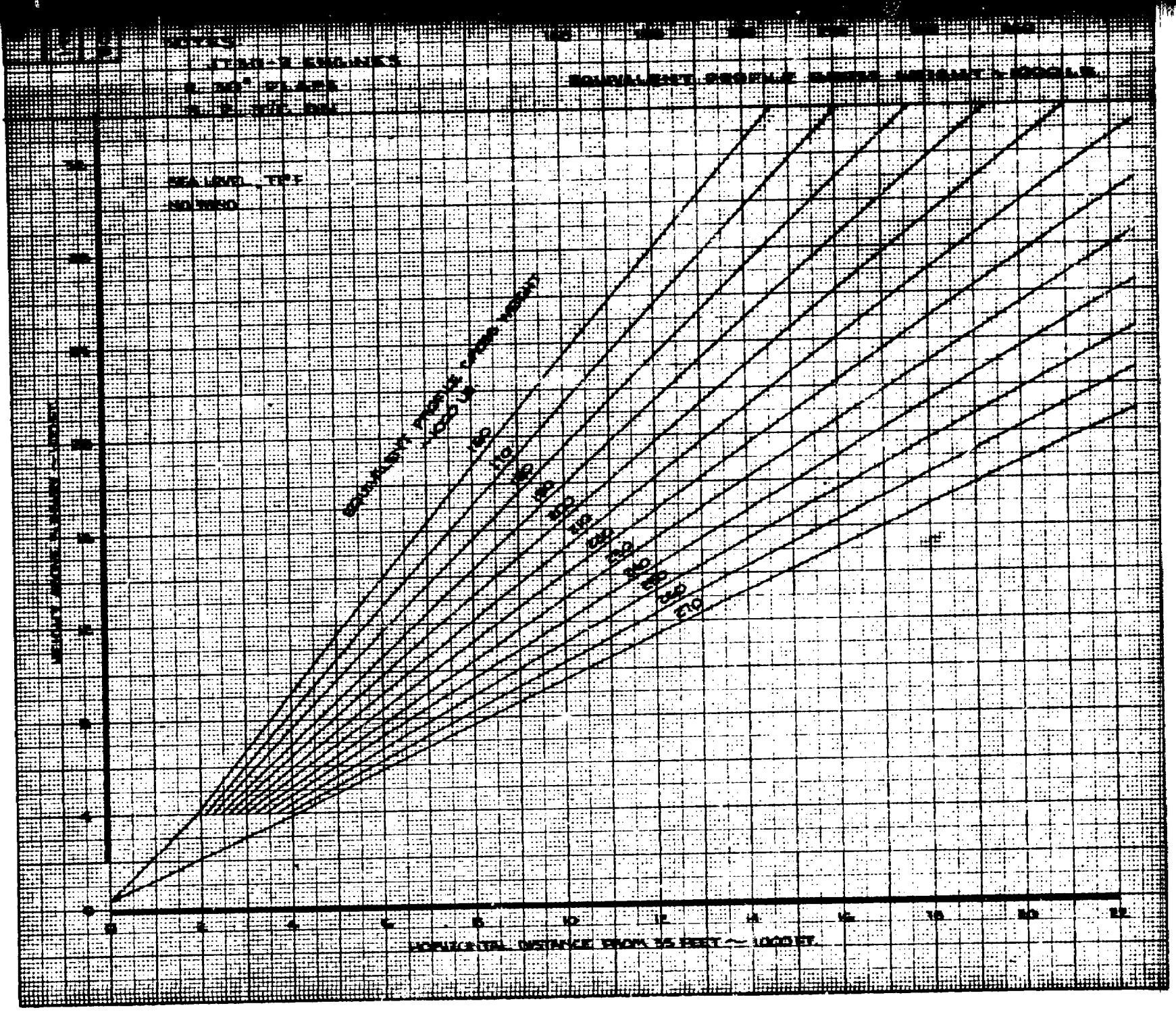


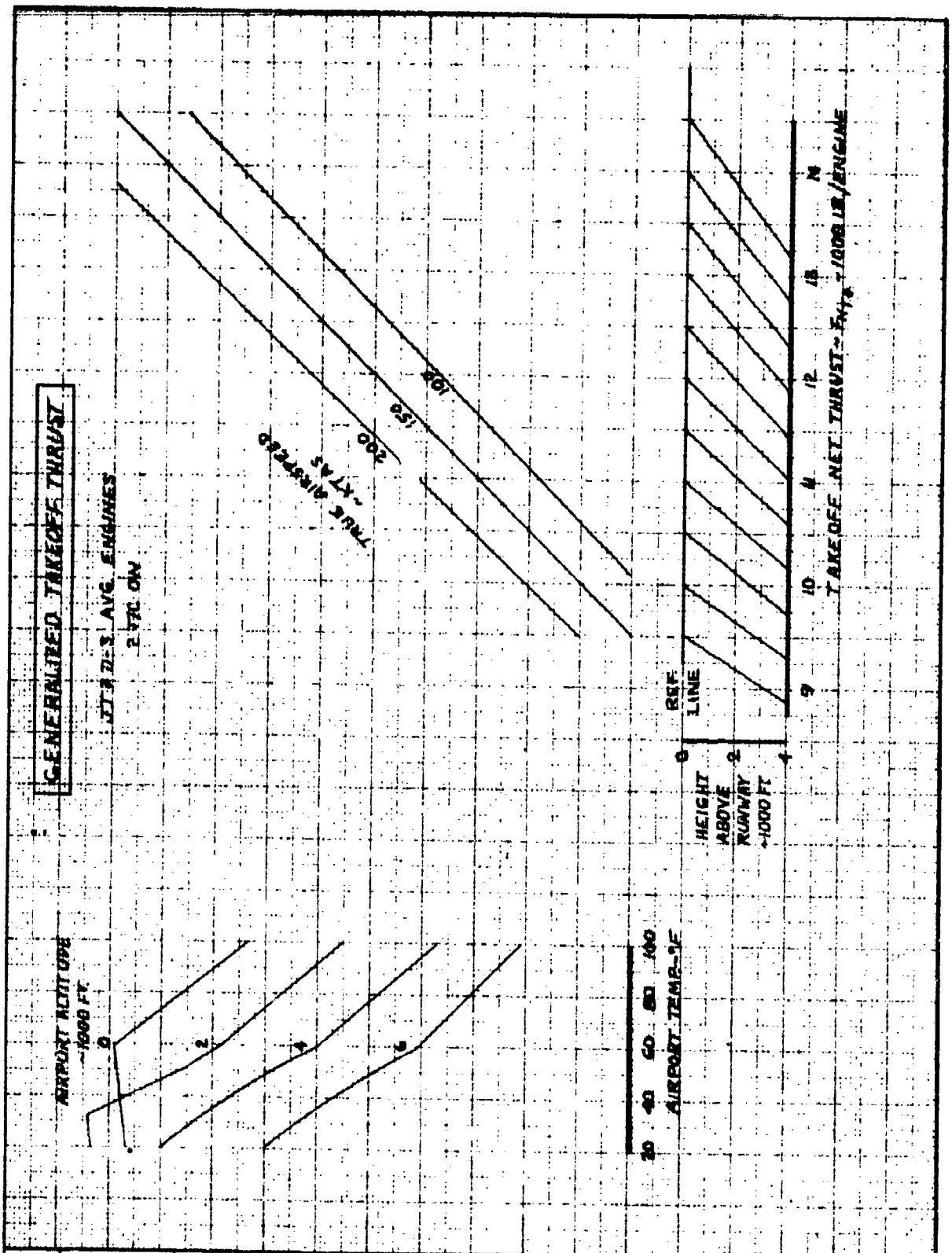
TRACING PAPER ALBANENE®


NOTES:
JT 3D-3 ENGINES
1. 30° FLAPS
2. T/S ON
60
160
200
EQUIVALENT BRAKE RELEASE GROSS WEIGHT x 1000 LB.
SEA LEVEL, 77°F
STANDARD DAY



TRACING PAPER
ALBANENE


SEA LEVEL, TYPE
HORIZONTAL DISTANCE FROM 35 FEET — 1000 FT.

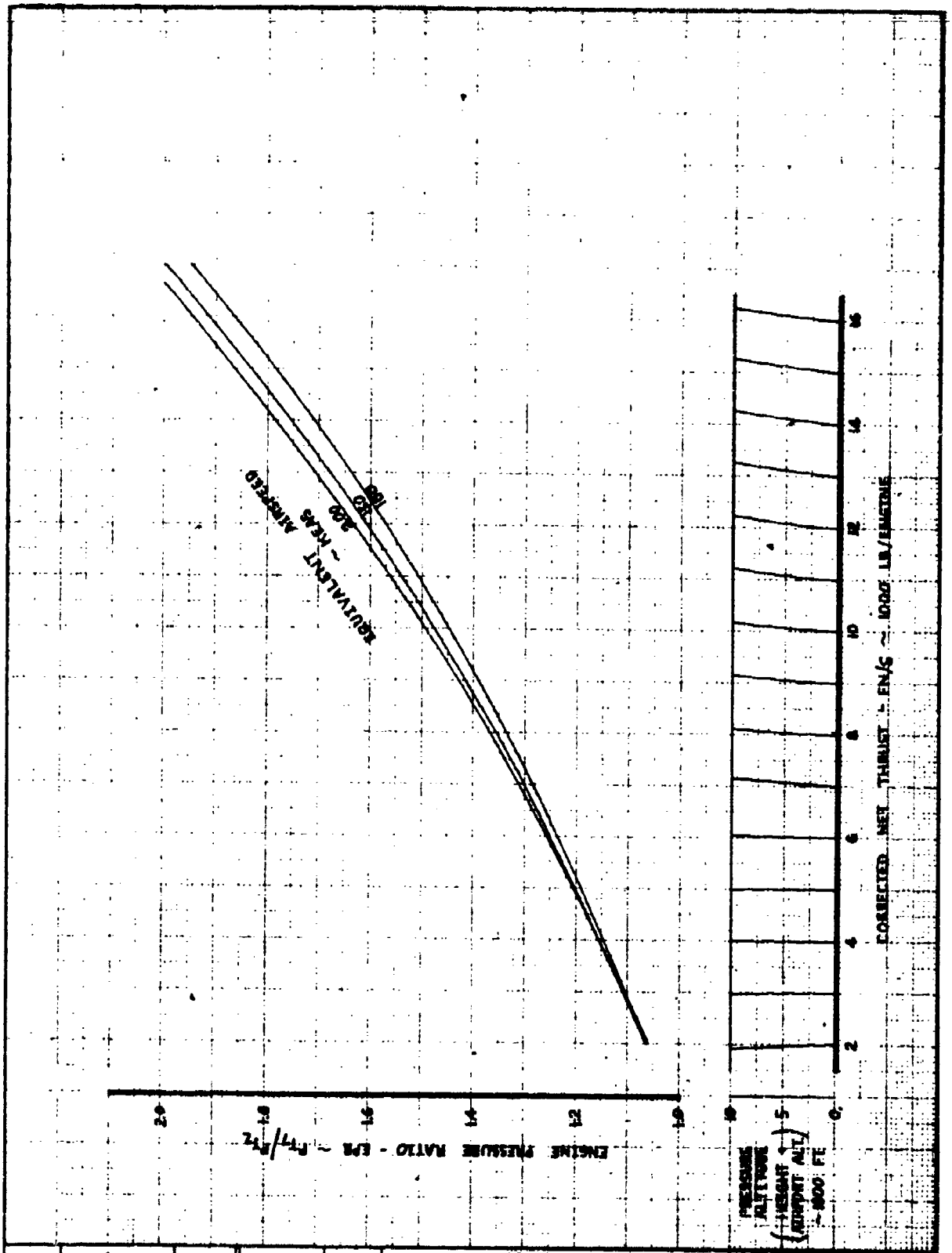


CALC	R.E. Bauhaus	8-31-73	REVISED	DATE
CHECK	LARSON	9-25-73	R.E.B.	10-15-73
APP			✓FRASER	10-16-73
APP				
INK	SCHROETER			

GENERALIZED TAKEOFF THRUST
JT3D-3 AVG. ENGINES

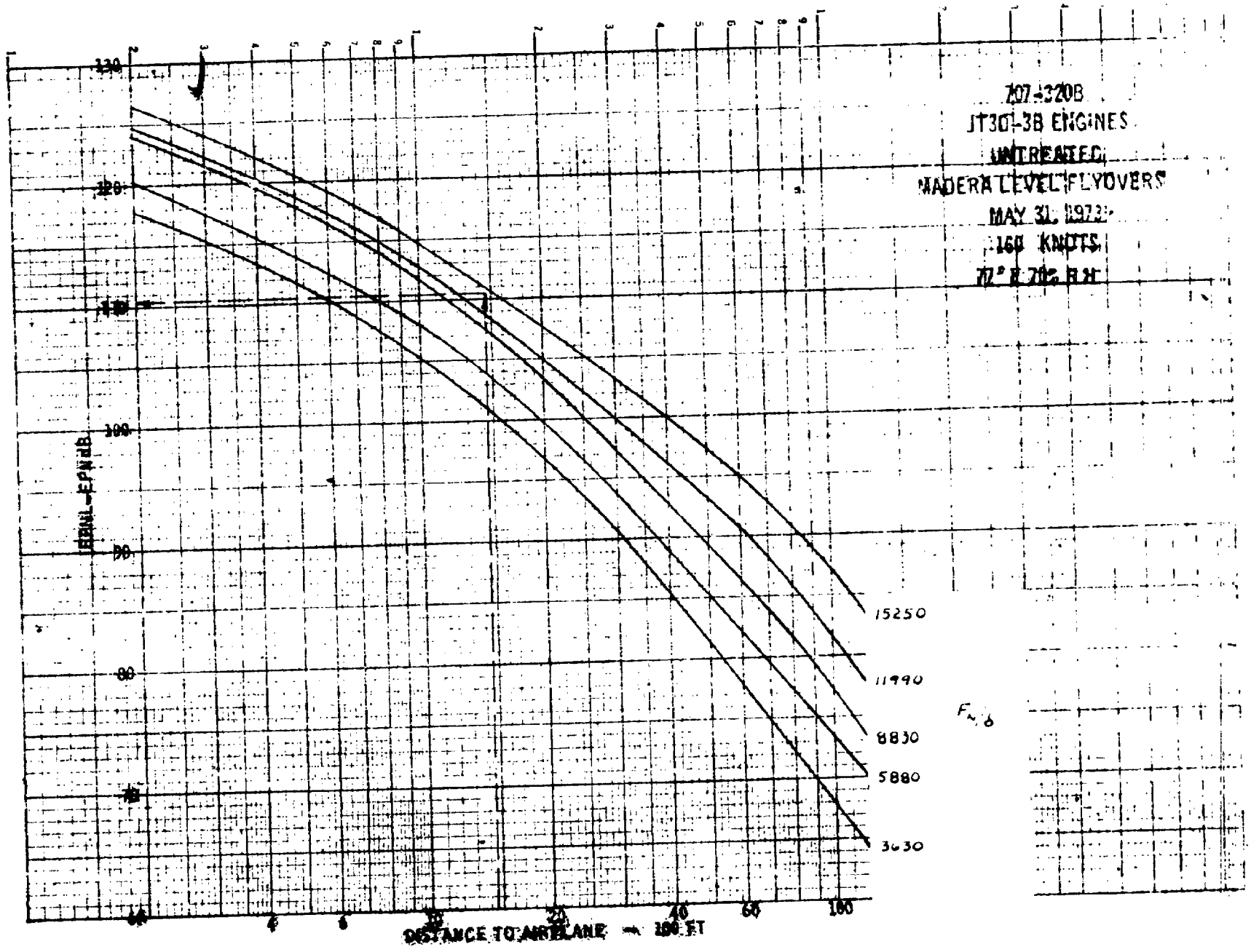
THE BOEING COMPANY

707-120B
D6-42141-1
PAGE 7.1.10



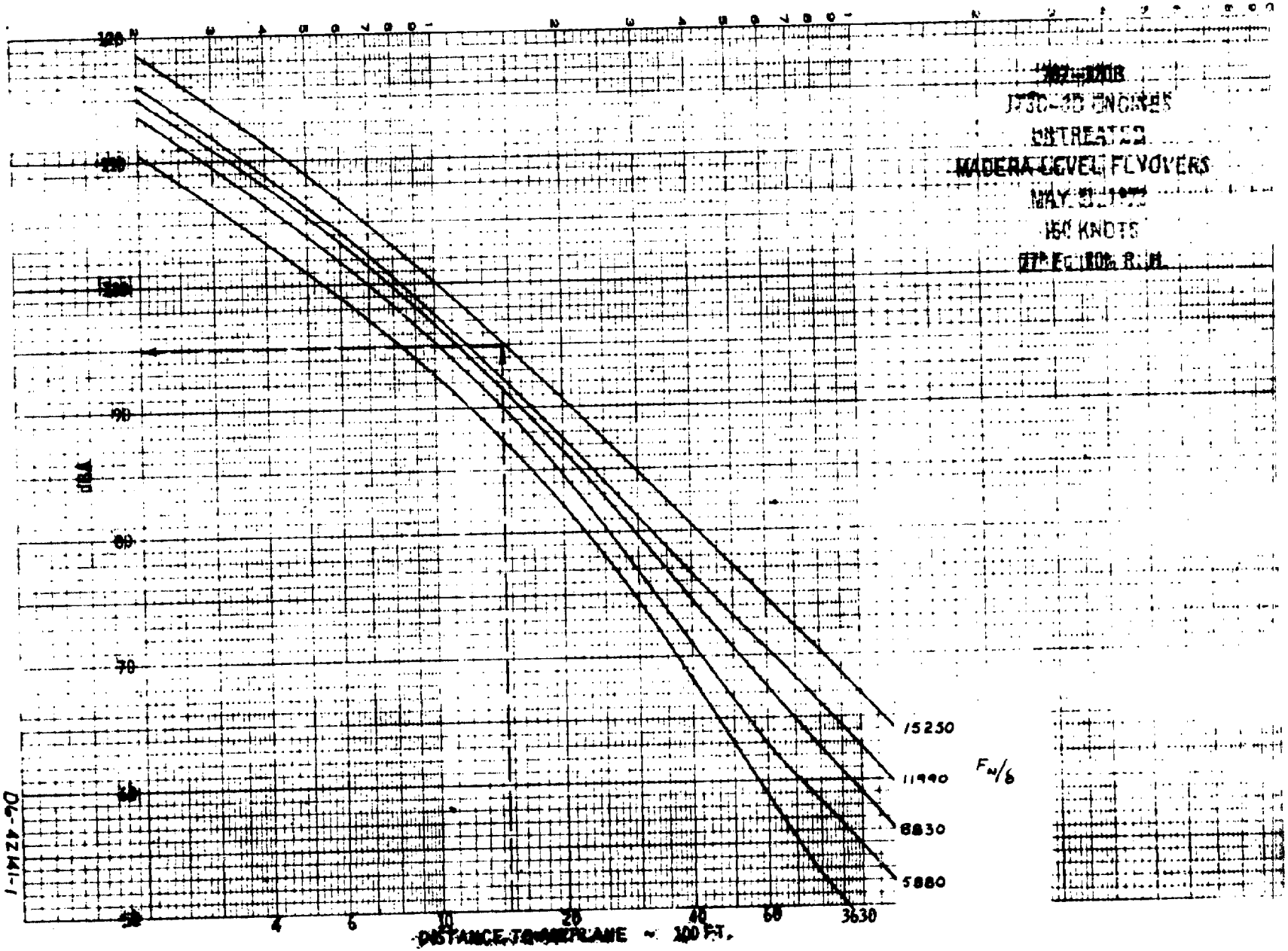
CALC	R. E. Buchholz	9-10-73	REVISED	DATE	CONVERSION CHART CORRECTED NET THRUST TO ENGINE PRESSURE RATIO JT3D-3, JT3D-1
CHECK	LARSON	9-25-73			
APR					
APR					
INH	W.G. BROOKS	9/11/73			THE BOEING COMPANY

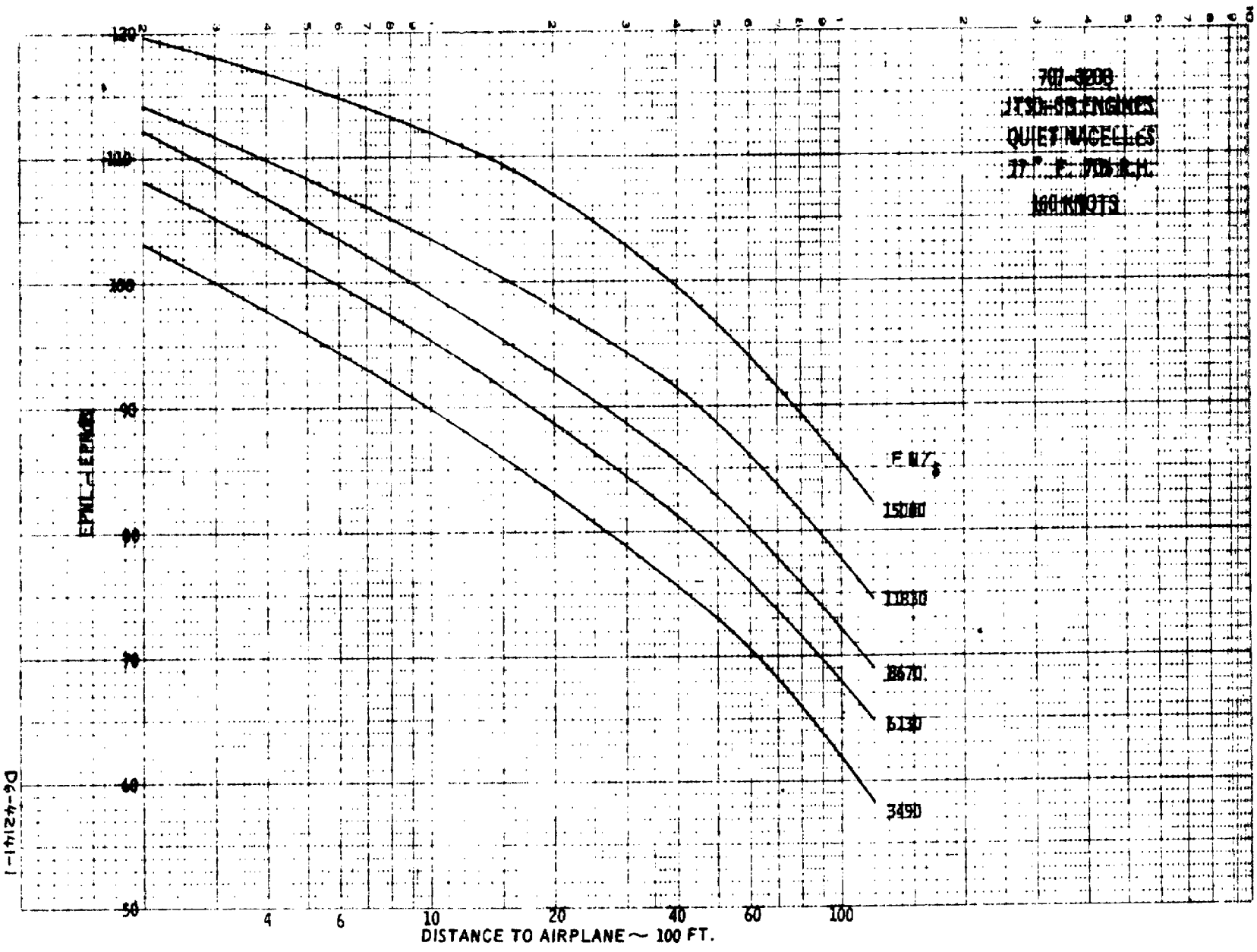
707-120B
7208
D6-42141-1
PAGE 7.1.11


707-320B
JT3D-3B ENGINES
UNTREATED
MADERA LEVEL FLYOVERS
MAY 31, 1973
160 KNOTS
70° F 70% R.H.
TBNL-EPNdB
DISTANCE TO AIRPLANE — 100 FT
15250
11990
8830
5880
3630
F.6

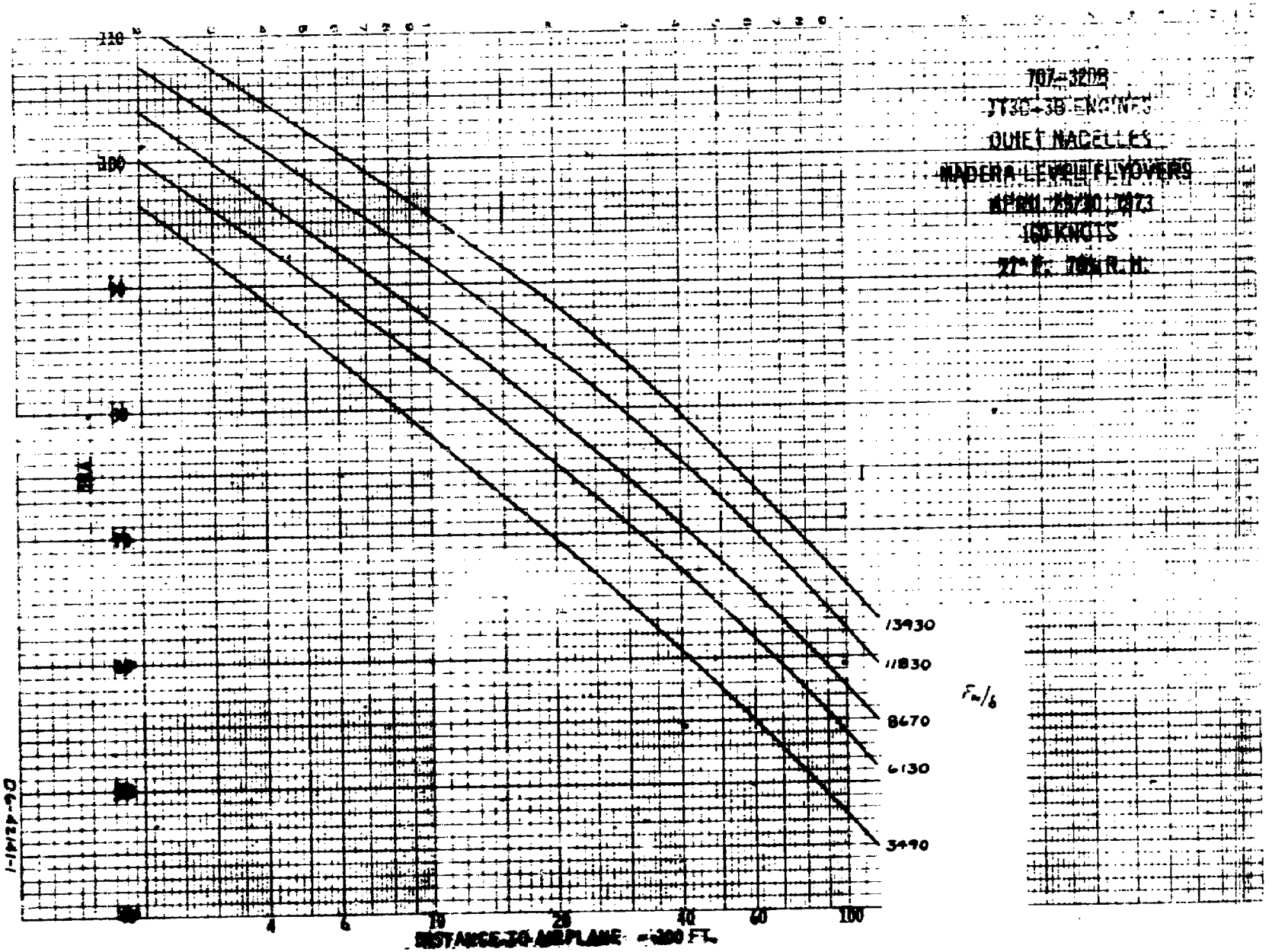
NO. 340R-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.

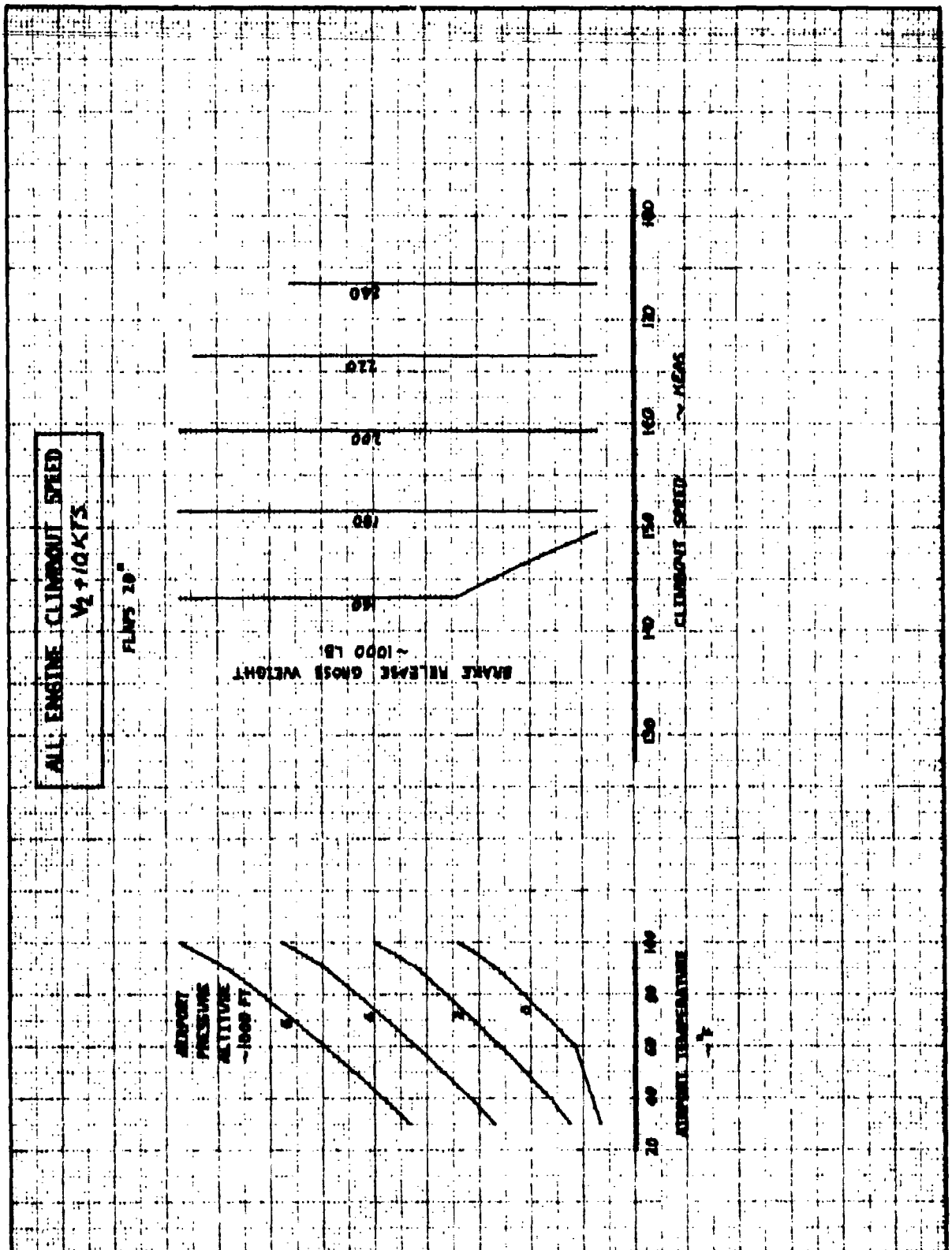




D6-42141-1
Page 7.1.14


707-320B
JT3D-3B ENGINES
QUIET NACELLES
MADERA LEVEL FLYOVERS
APRIL 25/30, 1973
150 KNOTS
27° F, 70% R.H.
13930
11830
8670
6130
3490
F_n/δ
110
100
90
80
70
60
50
40
4
6
10
20
40
60
100
DISTANCE TO AIRPLANE - 1000 FT.

7.2 720 B Aircraft with JT3D-1 Engines

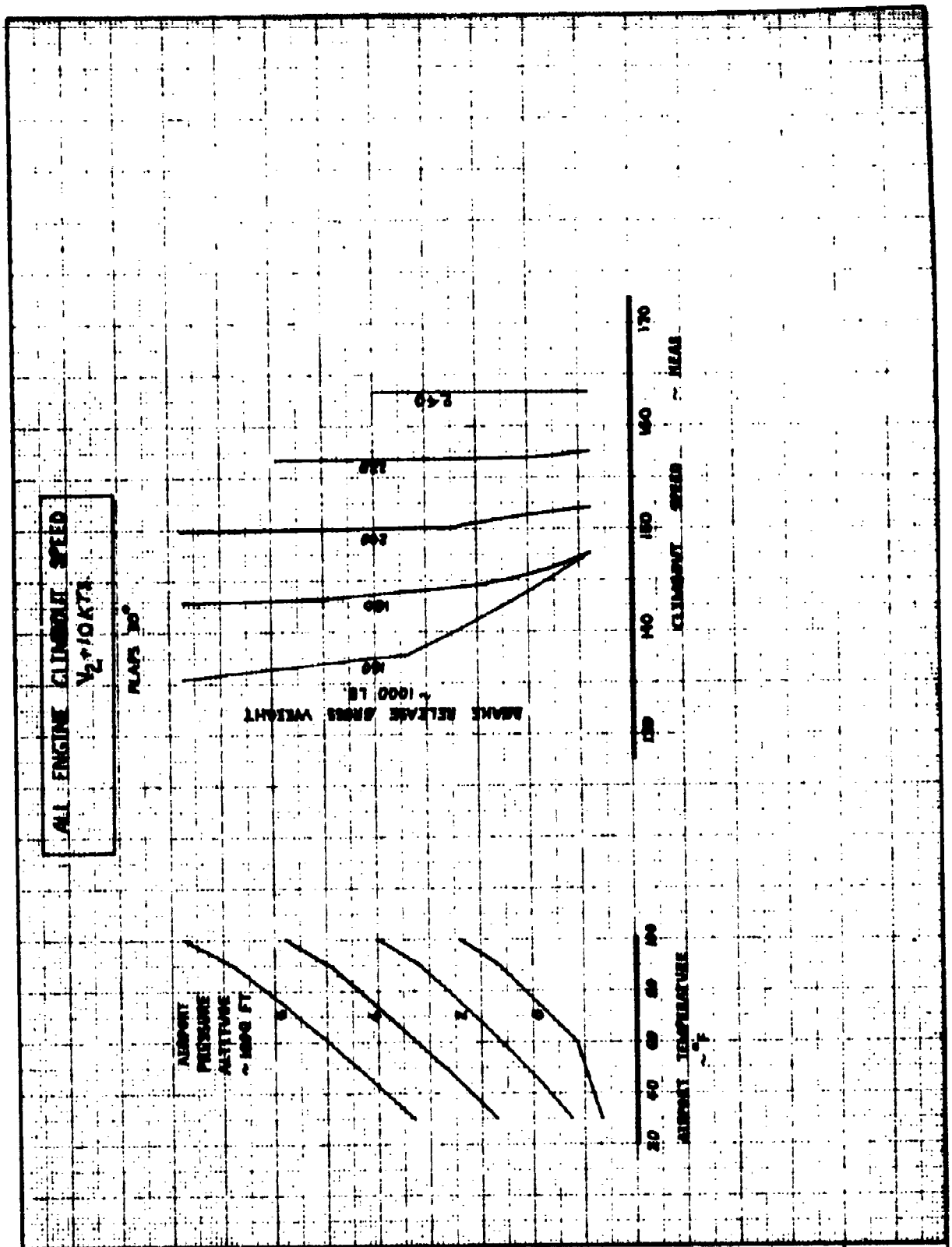


CALC	R.E. Bullens	9-10-73	REVISED	DATE	ALL ENGINE CLIMBOUT SPEED FLAPS 20° JT3D-1 ENGINES
CHECK	FRASER	9-19-73			
APR					
APR					
ENM	W.G. BROOKS	9/10/73			THE BOEING COMPANY

7208

D6-42141-1

PAGE 7.2.1

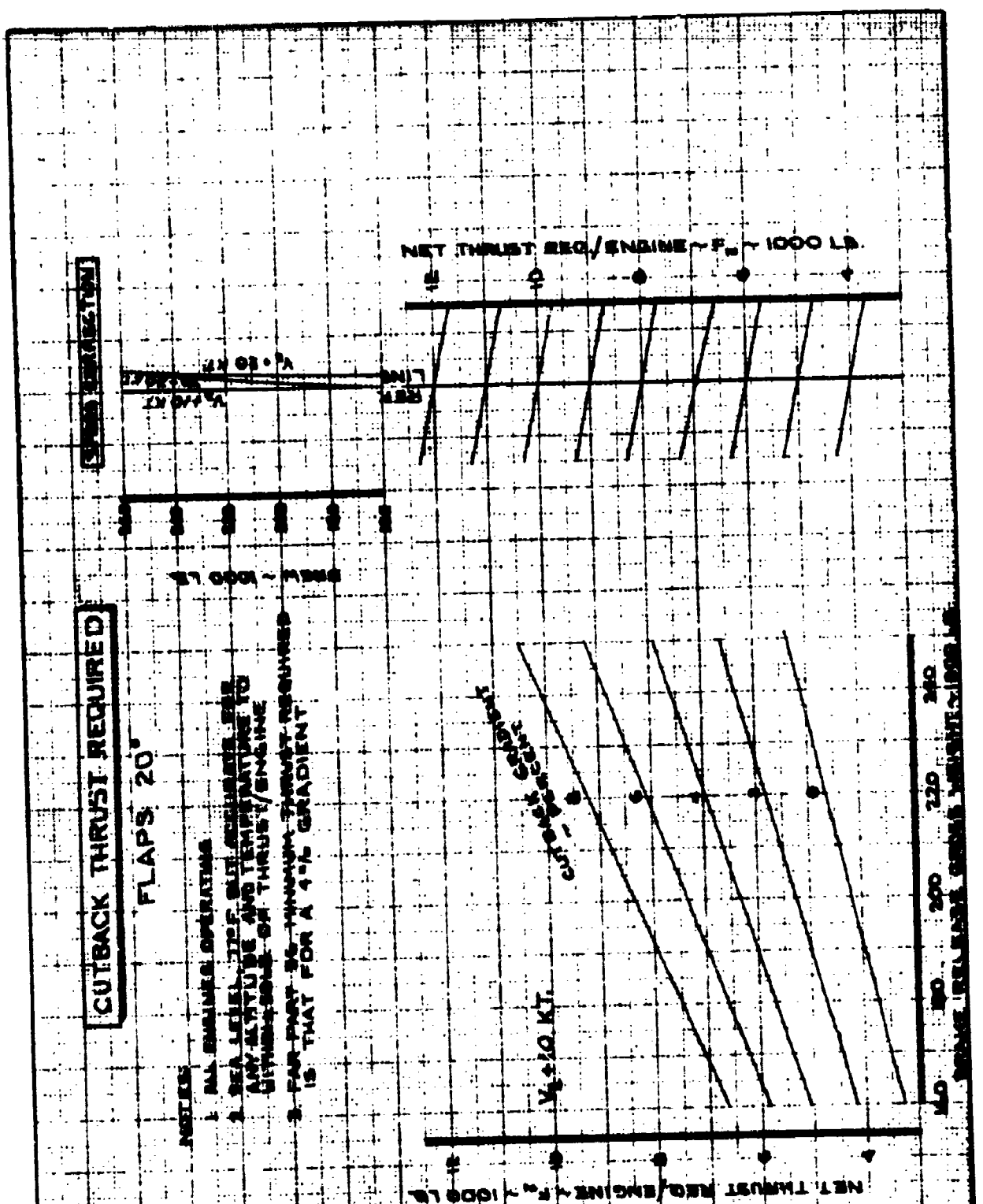


CALC	A.E. Byerlein	9-10-73	REVISED	DATE	ALL ENGINE CLIMBOUT SPEED FLAPS 30° JT3D-1 ENGINES
CHECK	FR & GR	9-24-73			
APR					
APR					
ENK	W.B. BROOKS	9/10/73			THE BOEING COMPANY

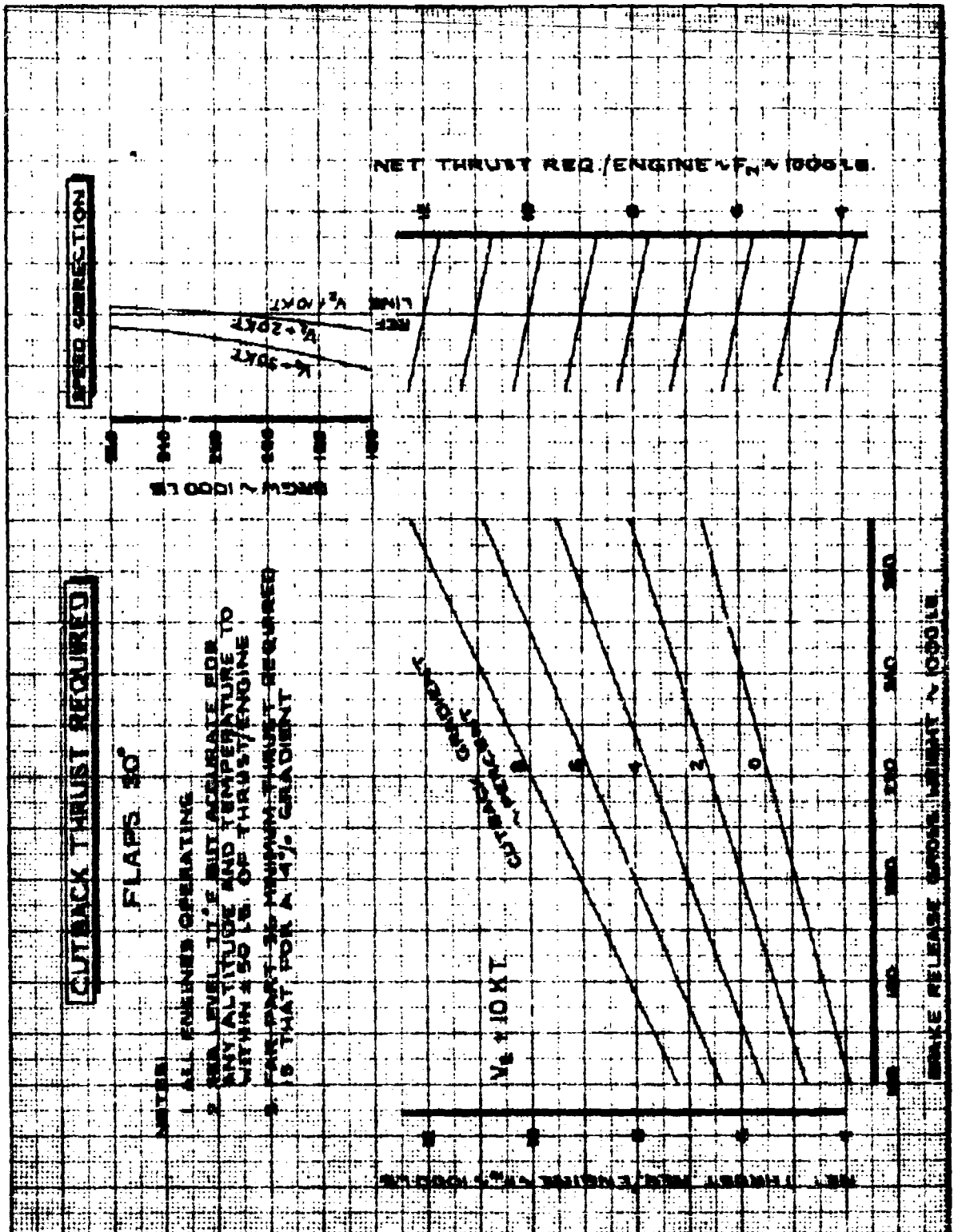
7208

D6-42141-1

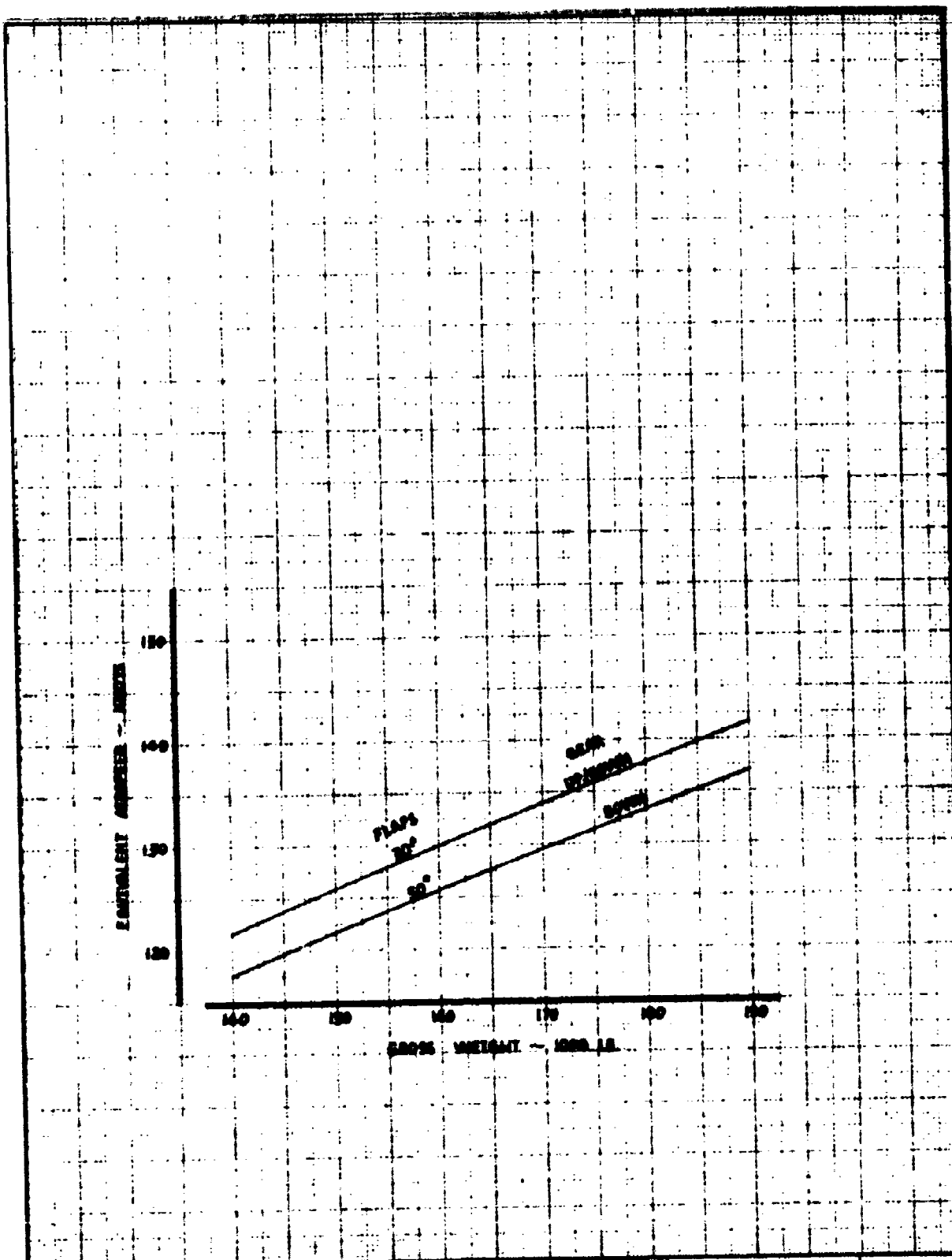
PAGE 7.2.2



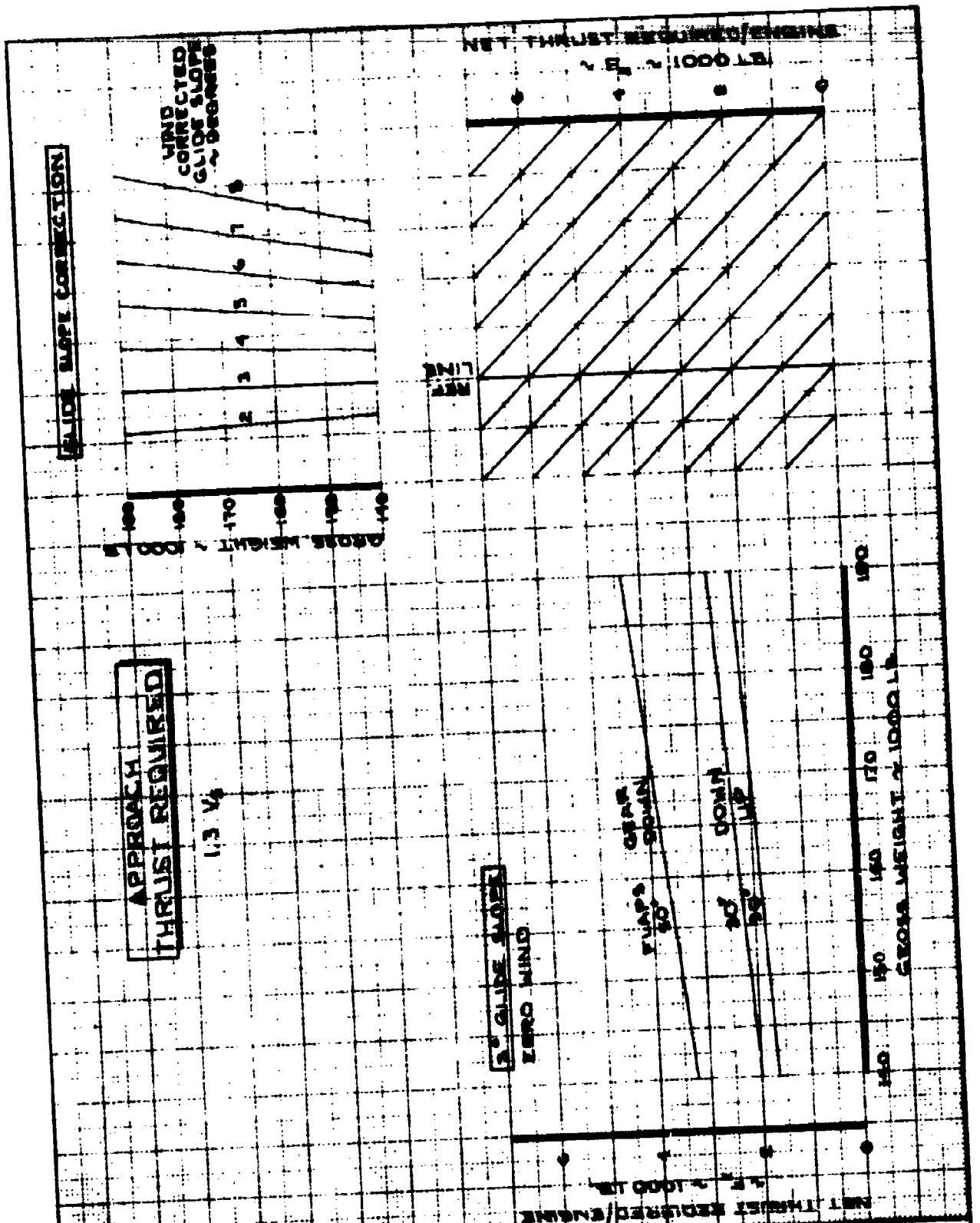
CALC	R.E. Buchholz	9-11-73	REVISED	DATE	CUTBACK THRUST REQUIRED 720 B
CHECK	FRASER	9-24-73	A E 8	11/19/73	V_2 + 10 KT. FLAPS 20° D6-42141-1
APR					THE BOEING COMPANY PAGE 7.2.3
APR					



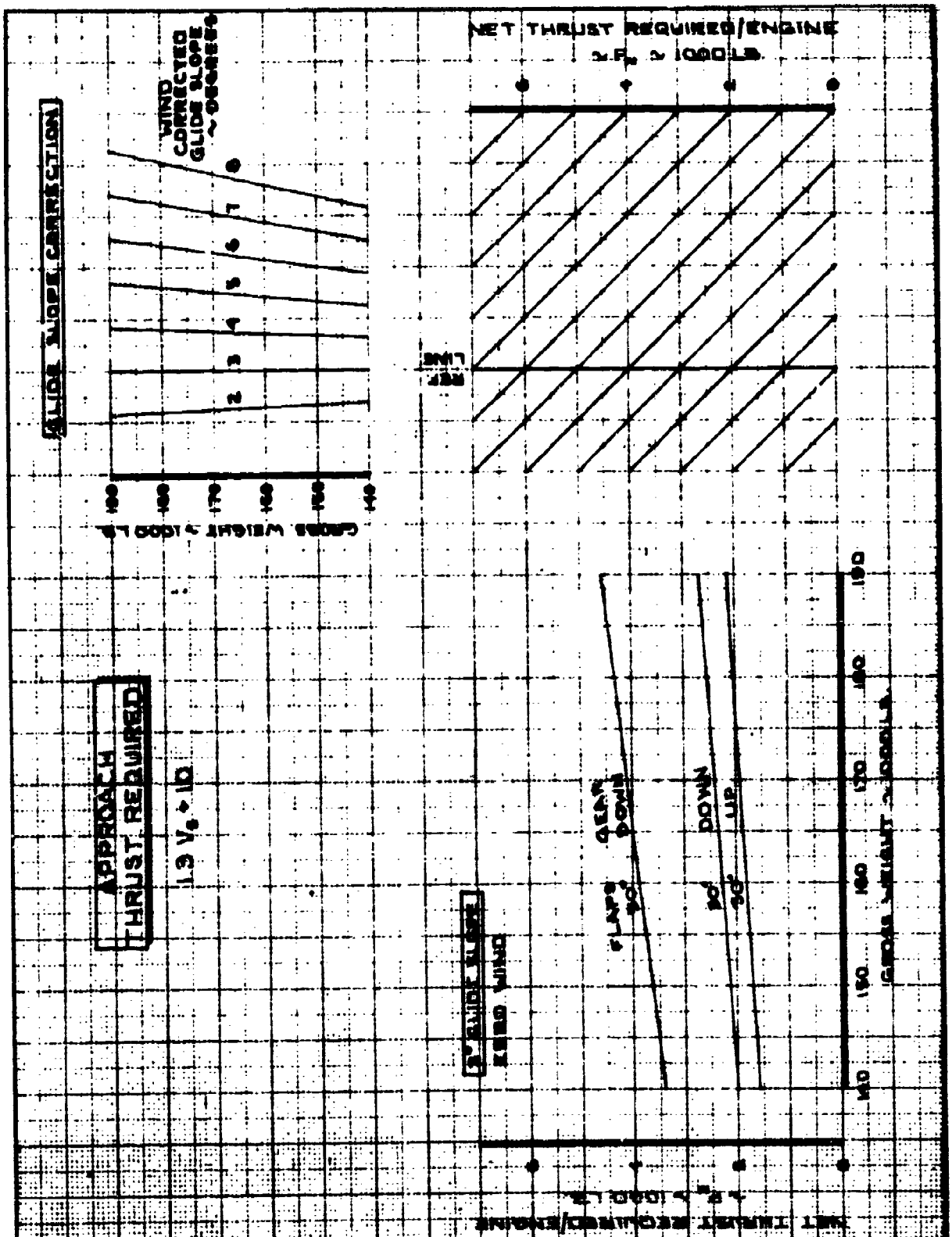
CALC	R E Buckholz	8-29-73	REVISED	DATE	CUTBACK THRUST REQUIRED 720B
CHECK	FRASER	8-29-73	R E B		V_2 + 10 KT FLAPS 30° D6-42141-1
APR					THE BOEING COMPANY PAGE T 2.4
APR					
PLOT	SCHROETER	8/29/73			



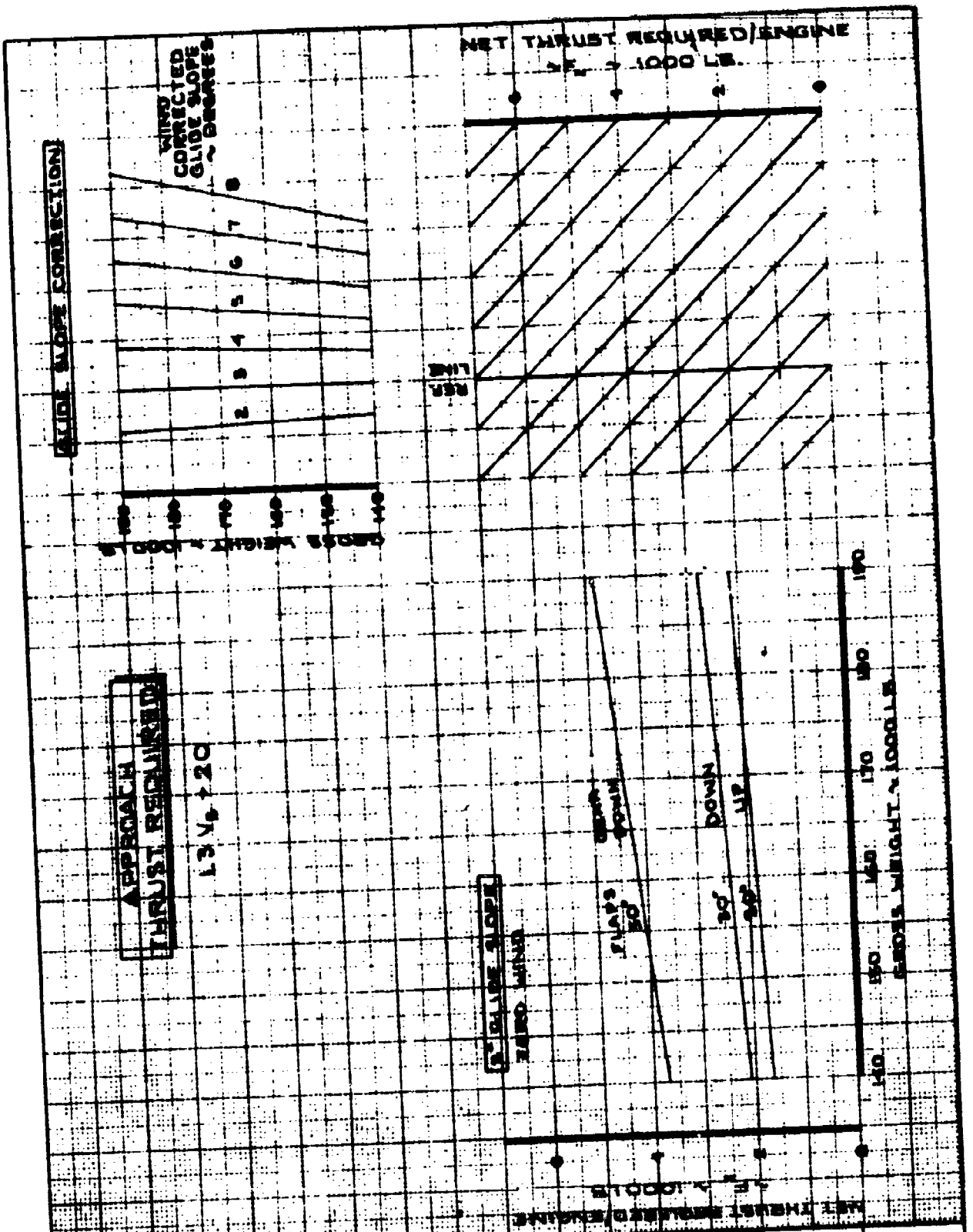
CALC	R. E. Bucklin	9-10-73	REVISED	DATE	APPROACH SPEED 1.3 V_S	720B
CHECK	F R Gs c R	9 29 73				D6-42141-1
APP					THE BOEING COMPANY	PAGE 7.2.5
APP						
ENG	W. O. BROOKS	9/11/73				



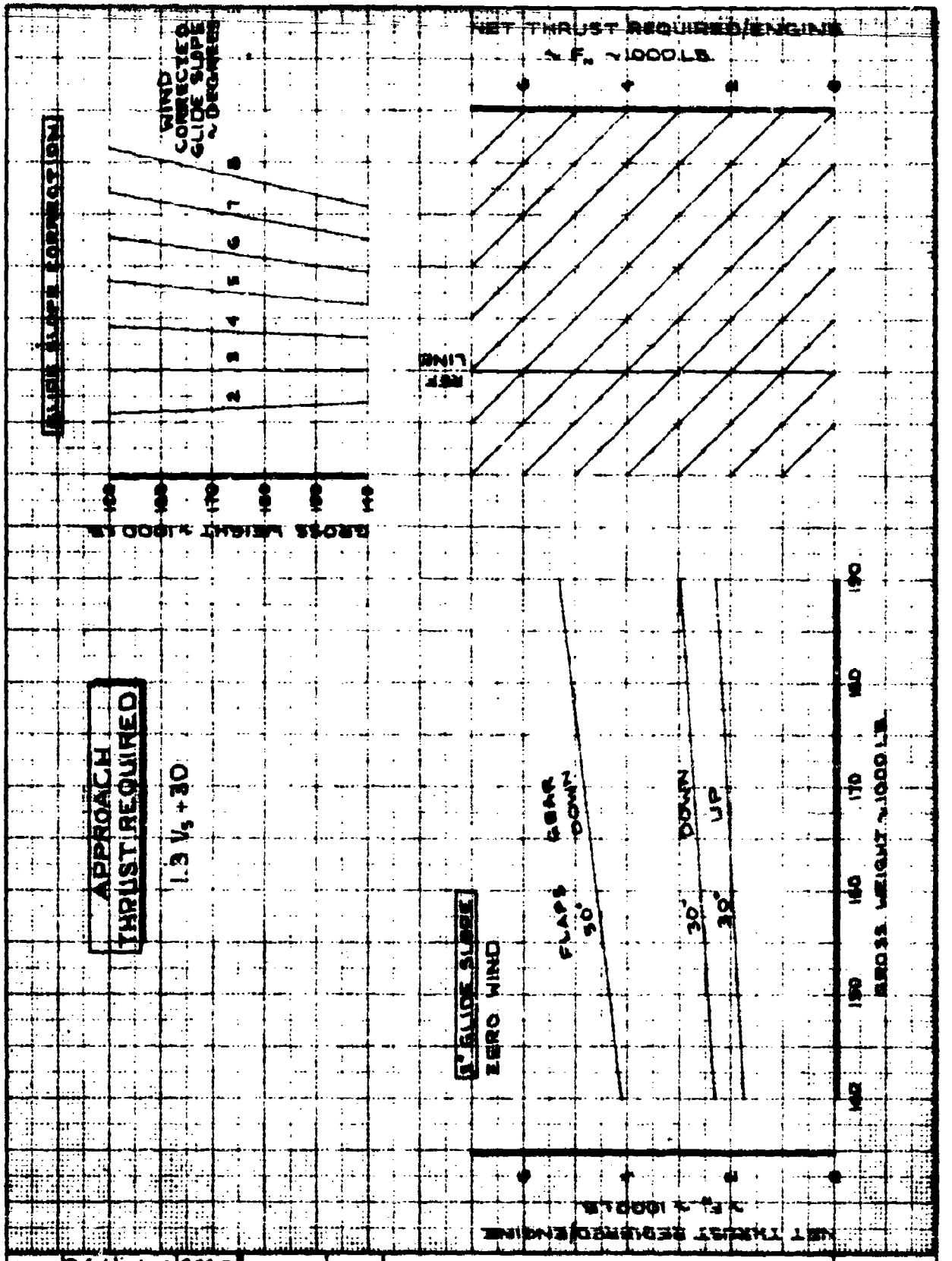
			REVISED	DATE	APPROACH THRUST REQUIRED	720 B
CALC	D.G. Williams	9.21.71			1.3 V_s	D6-42141-1
CHECK	FRASER	9.21.71				
APR					THE BOEING COMPANY	PAGE 7.2.6
APR						



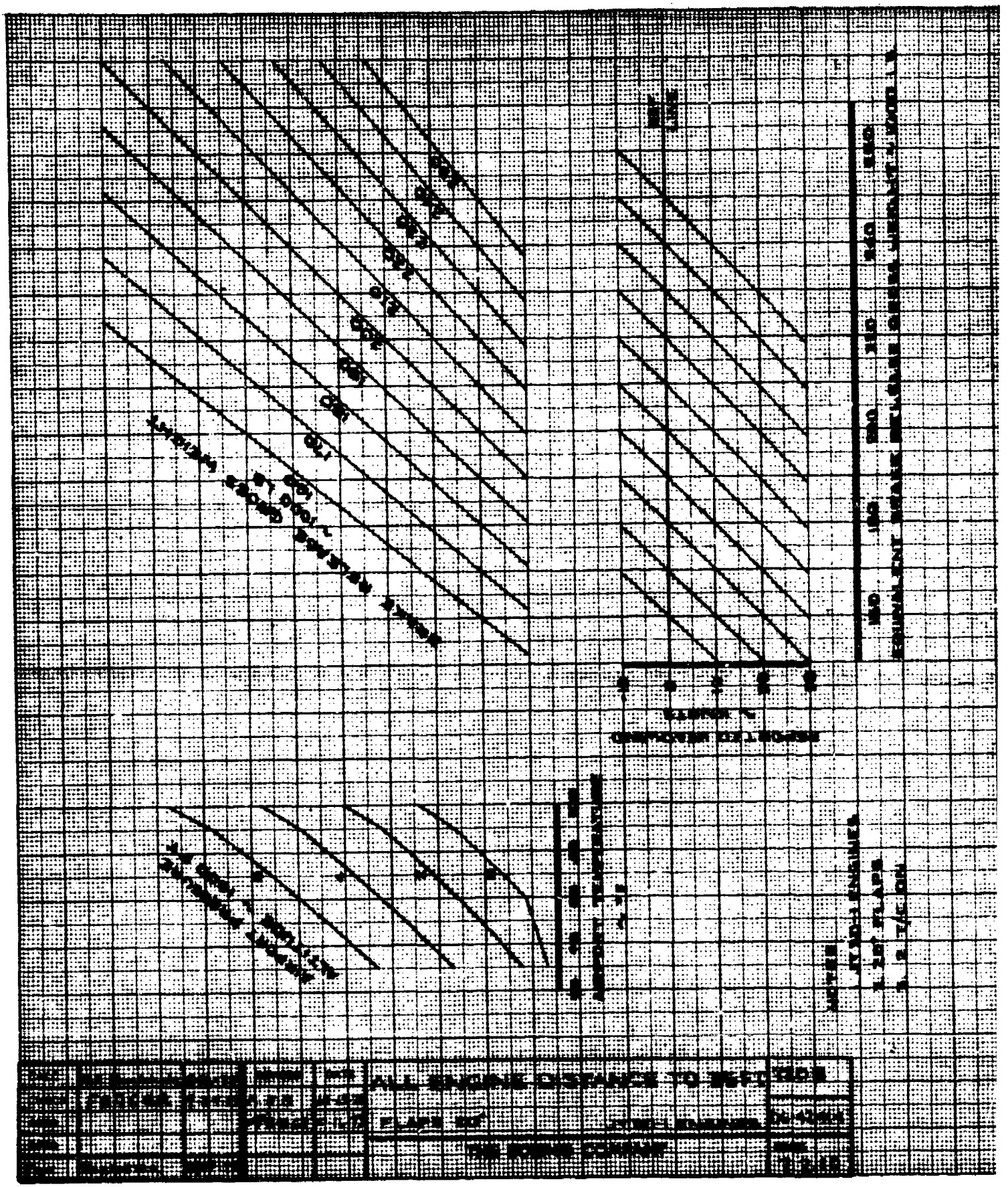
			REVISED	DATE	APPROACH THRUST REQUIRED	720 B
CALC	R.G. Williams	9-28-71			13 V_S + 10	D6-42141-1
CHECK	FRASER	9-29-71				
APR					THE BOEING COMPANY	PAGE 7.2.7
APR						

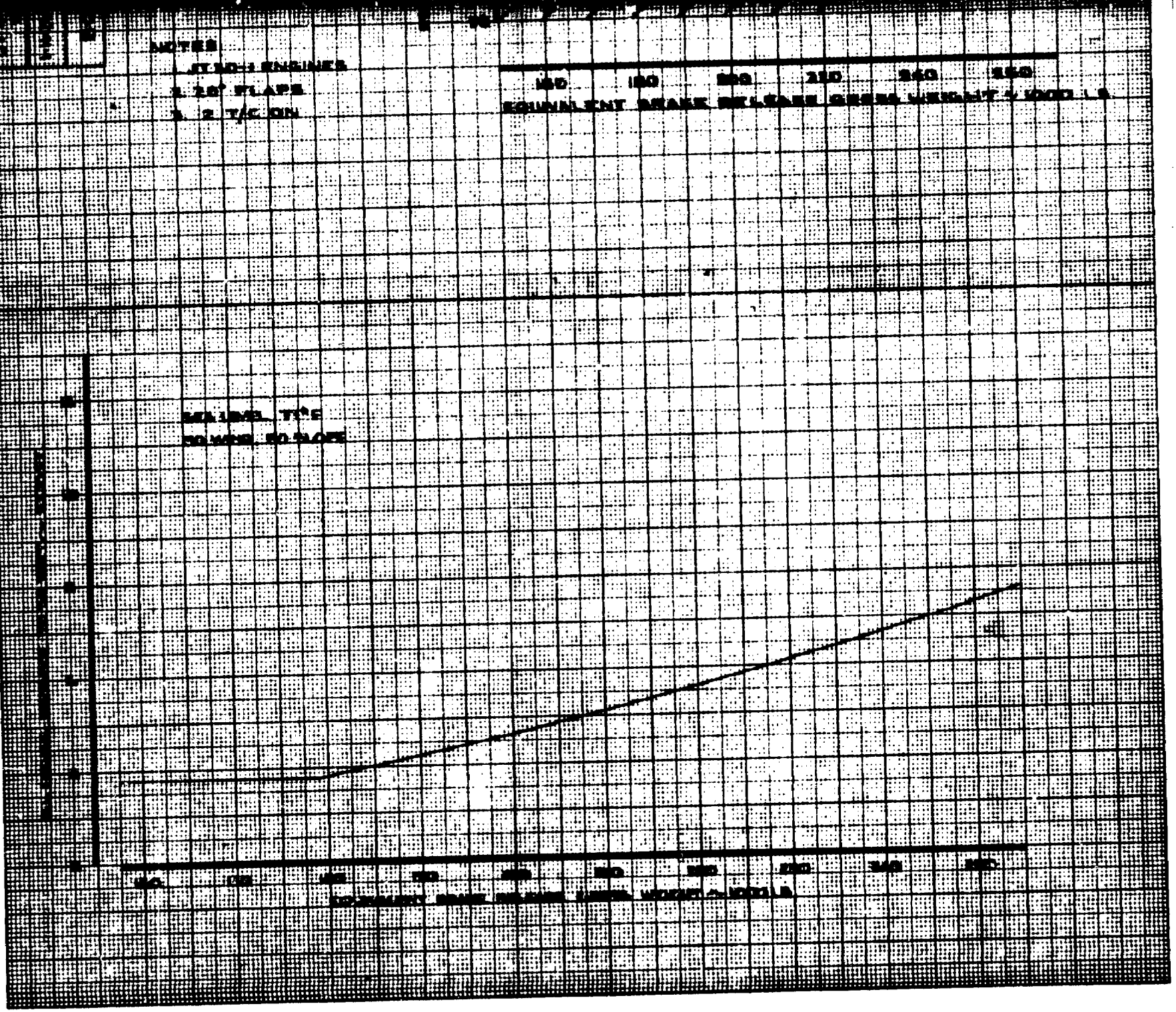


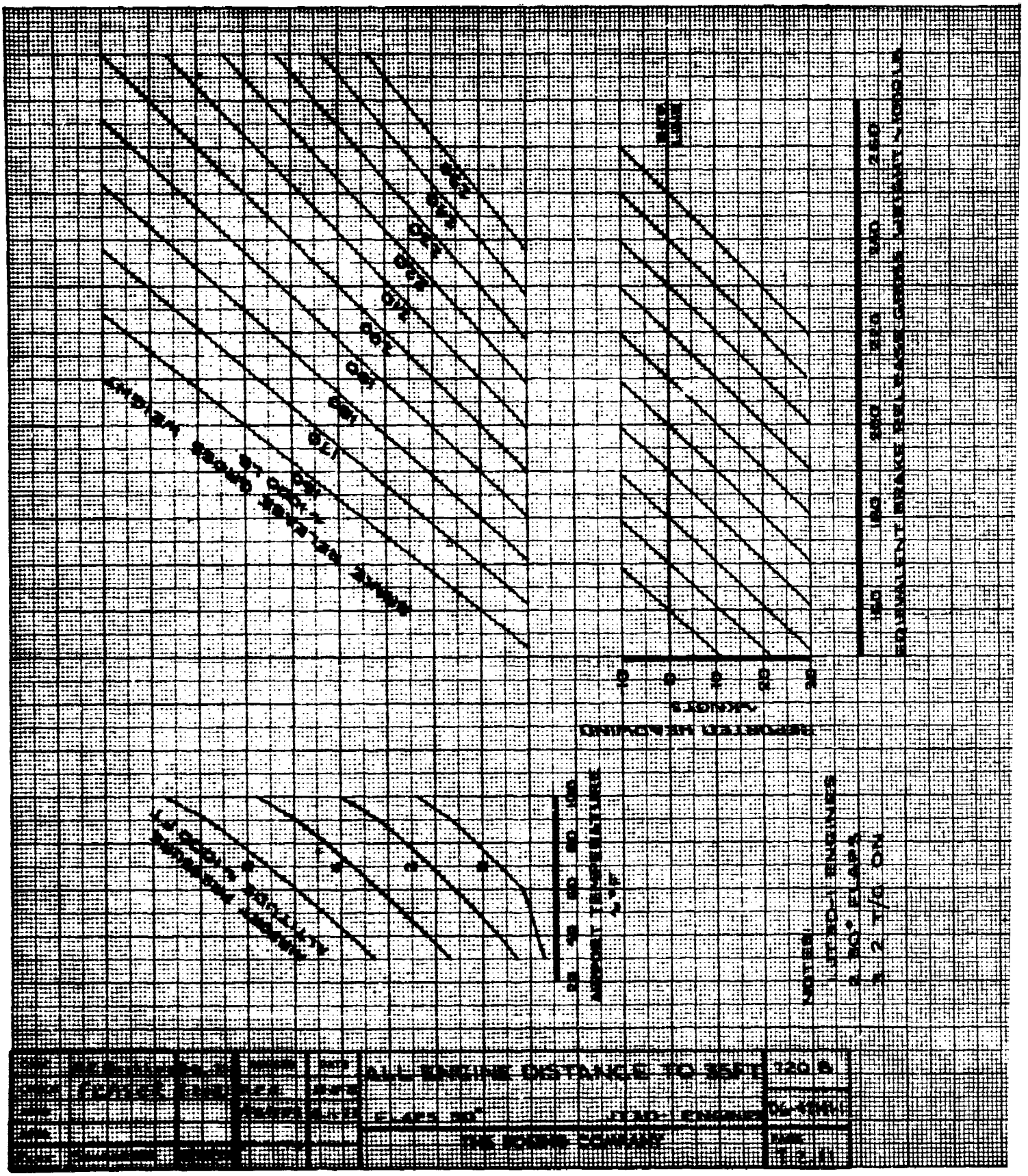
CALC	B.G. Williams	8-21-72	REVISED	DATE	APPROACH THRUST REQUIRED	720 B
CHECK	FRASER	9-24-72			1.3 V_S + 20	D6-42141-1
APR					THE BOEING COMPANY	PAGE 7.2.8
APR						

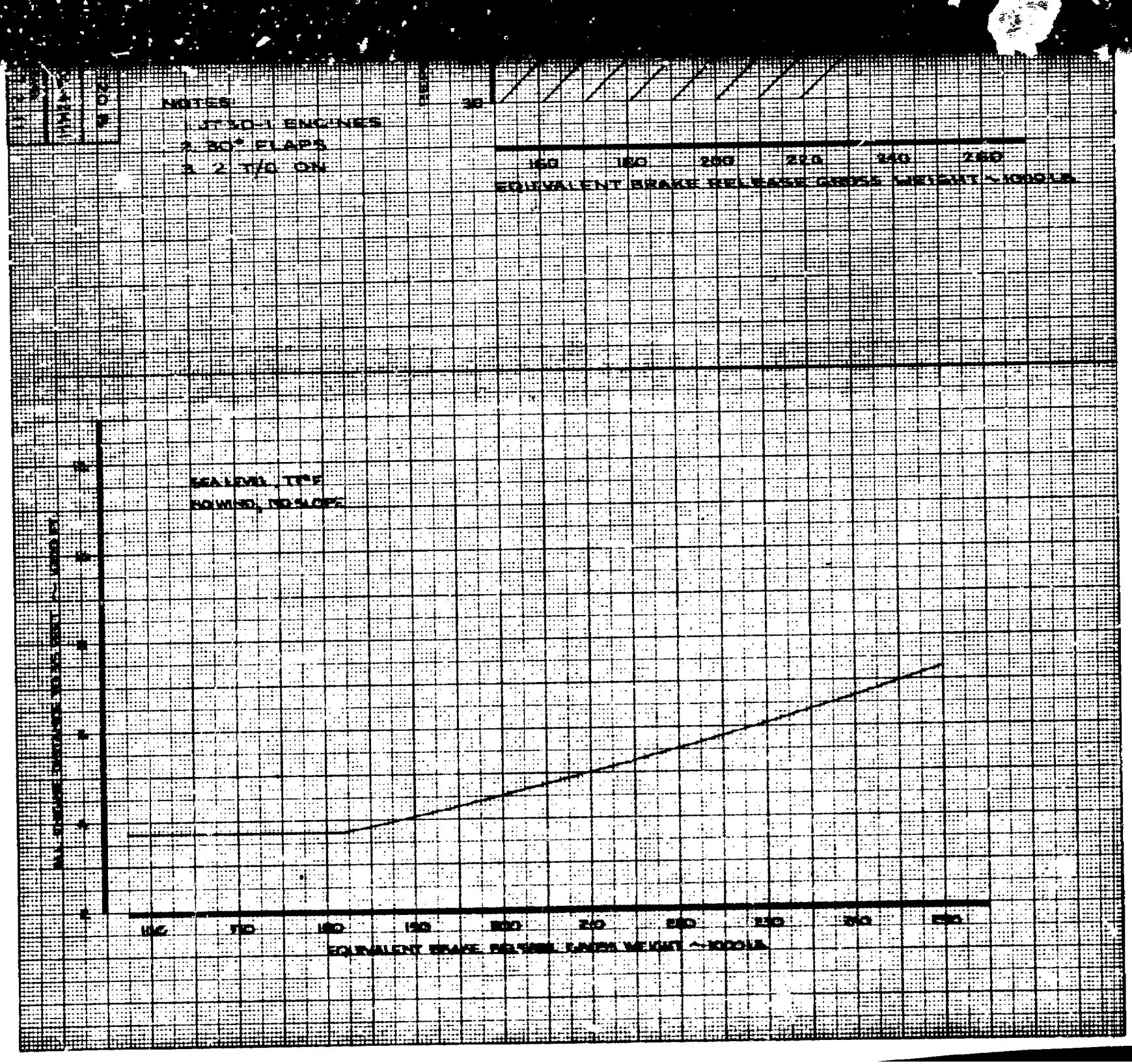


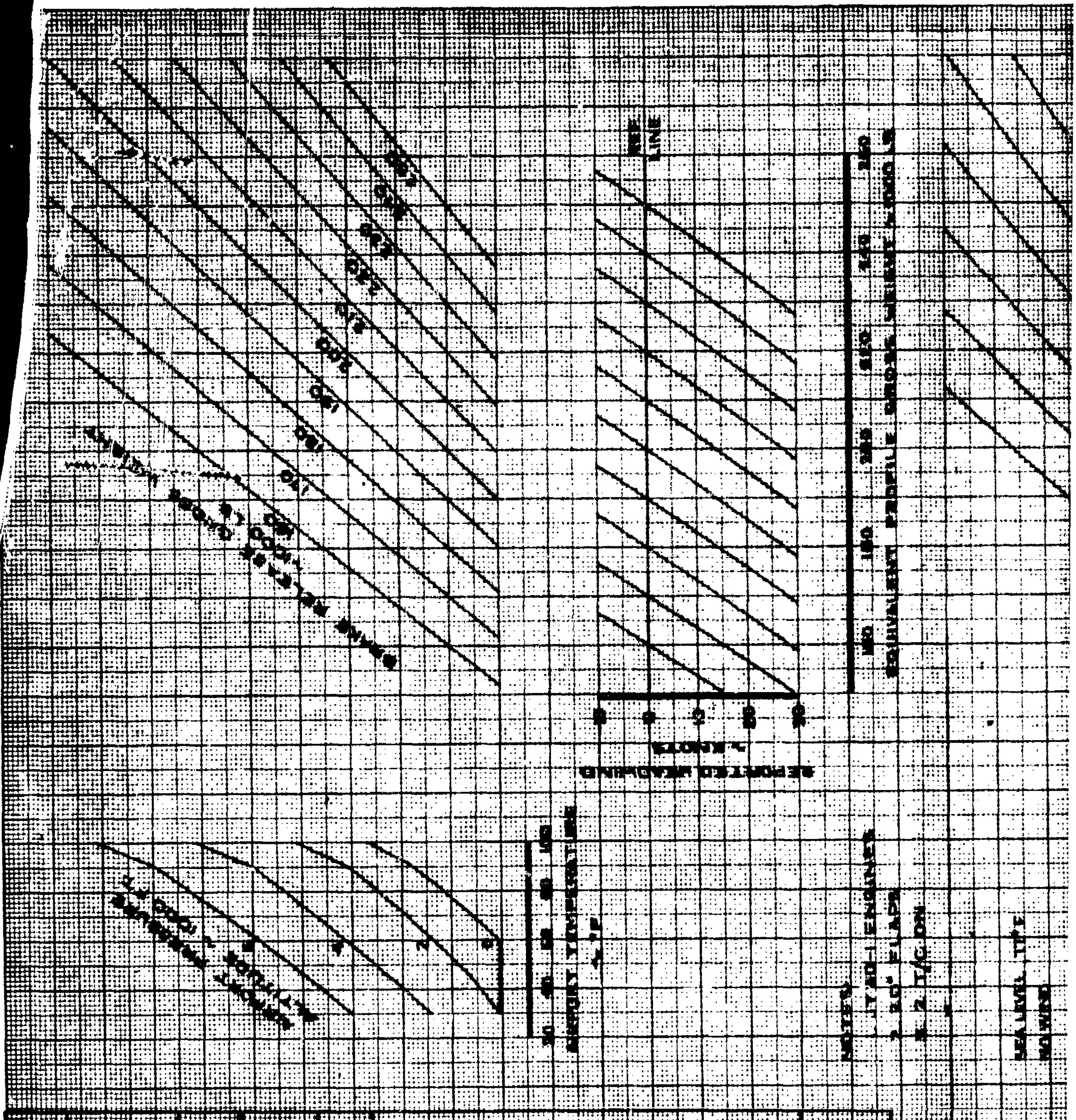
CALC	B.G Williams	8.29.72	REVISED	DATE	APPROACH THRUST REQUIRED 1.3 V_S + 30	720 B
CHECK	FRASER	9.21.72				D6-42141-1
APP					THE BOEING COMPANY	PAGE 7.2.9
APP						




NOTES
JT3D-3 ENGINES
2. 20° FLAPS
3. 2 T/C ON
180
190
200
210
220
230
EQUIVALENT BRAKE RELEASE GROSS WEIGHT x 1000 LB.




NOTES:
1. JT10-1 ENGINES
2. 30° FLAPS
3. 2 T/O ON
SEA LEVEL, 77°F
NO WIND, NO SLOPE
EQUIVALENT BRAKE RELEASE GROSS WEIGHT ~1000 LB.
EQUIVALENT BRAKE RELEASE GROSS WEIGHT ~1000 LB.



ALL ENGINE CLIMBOUT PROFILE

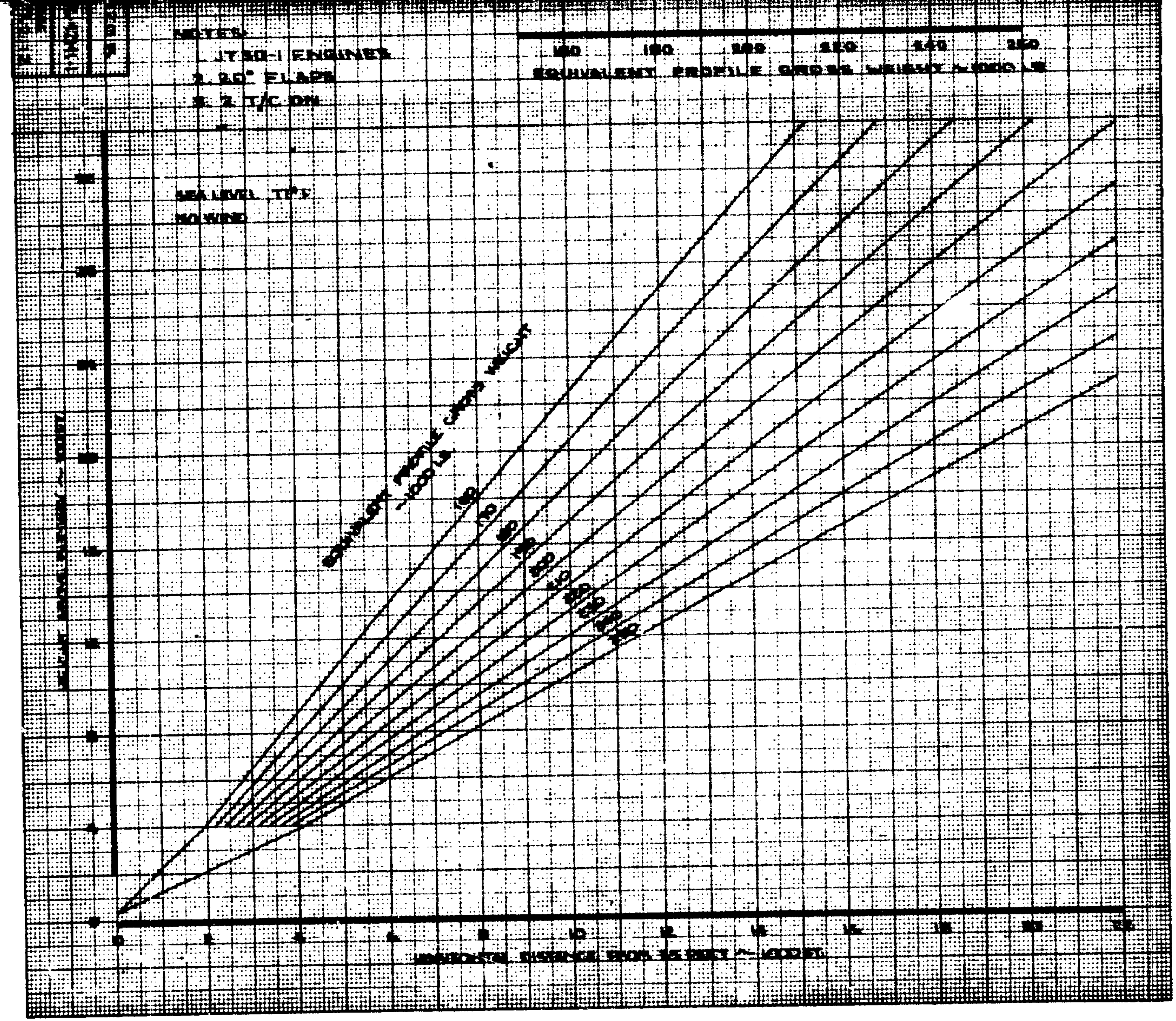
$V_2 + 10K$

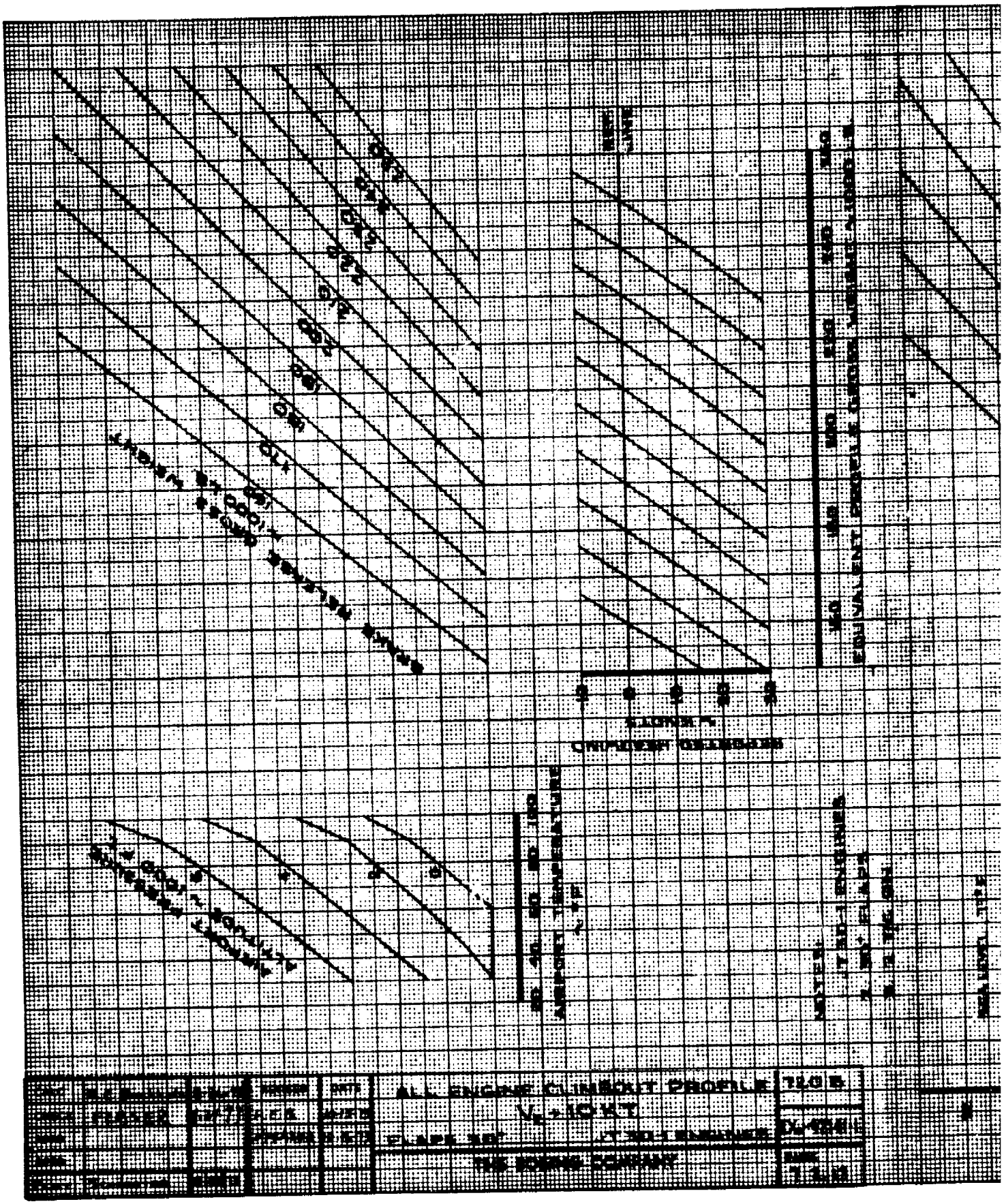
FLAPS 20°

THE BOEING CO[illegible]

D1-4100-5620 ORIG. 3/71

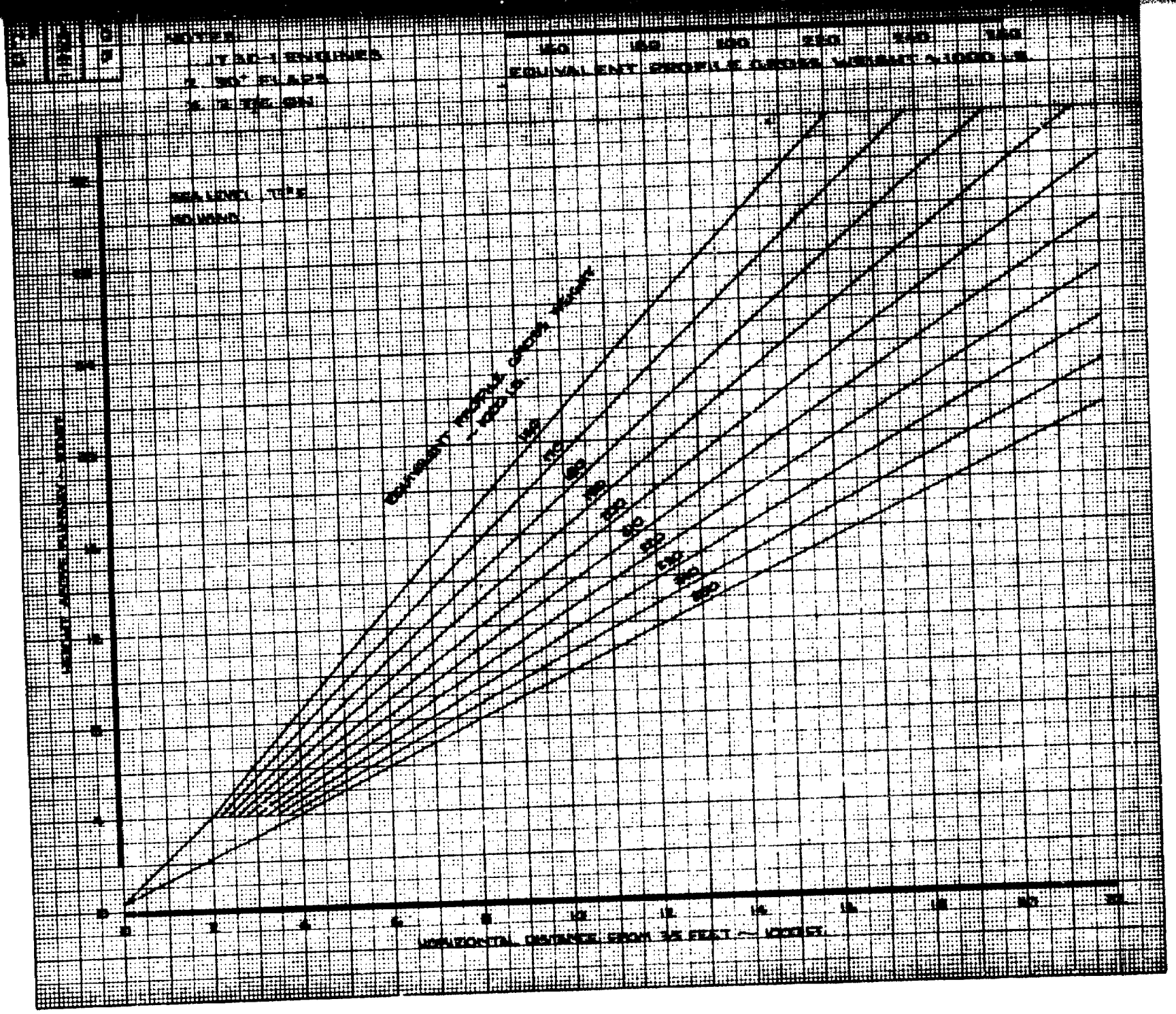
TRACING PAPER ALBANENE

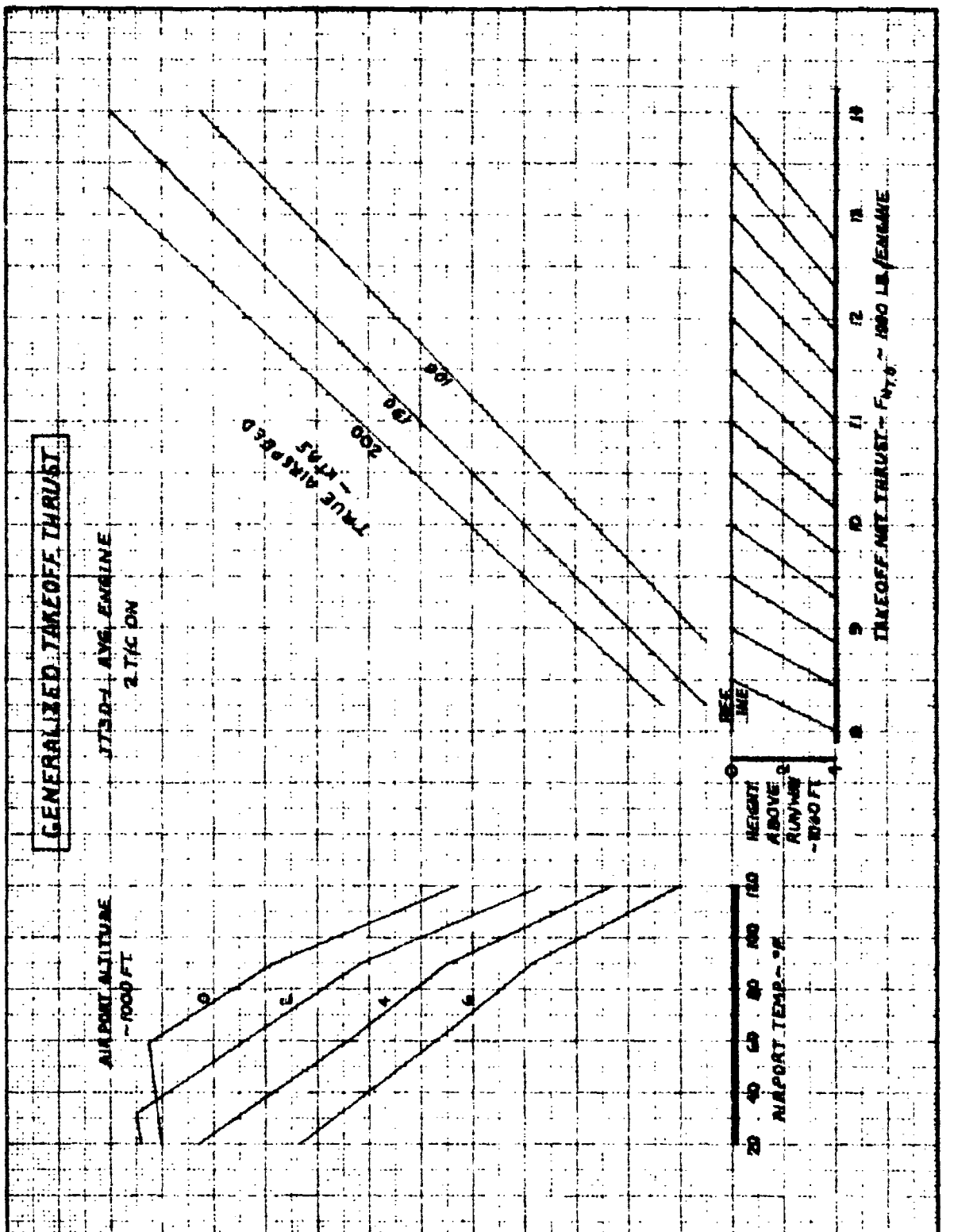

NOTES:
1. JT3D-1 ENGINES
2. 30° FLAPS
3. 2 T/C ON
NO WIND
160 180 200 220 240 260
EQUIVALENT PROFILE GROSS WEIGHT ~1000 LB
EQUIVALENT PROFILE GROSS WEIGHT ~1000 LB
0 2 4 6 8 10 12 14 16 18 20 22
HORIZONTAL DISTANCE FROM 35 FEET ~ 1000 FT



D1-4100-8620 ORIG. 3/71

TRACING PAPER
ALBANENE

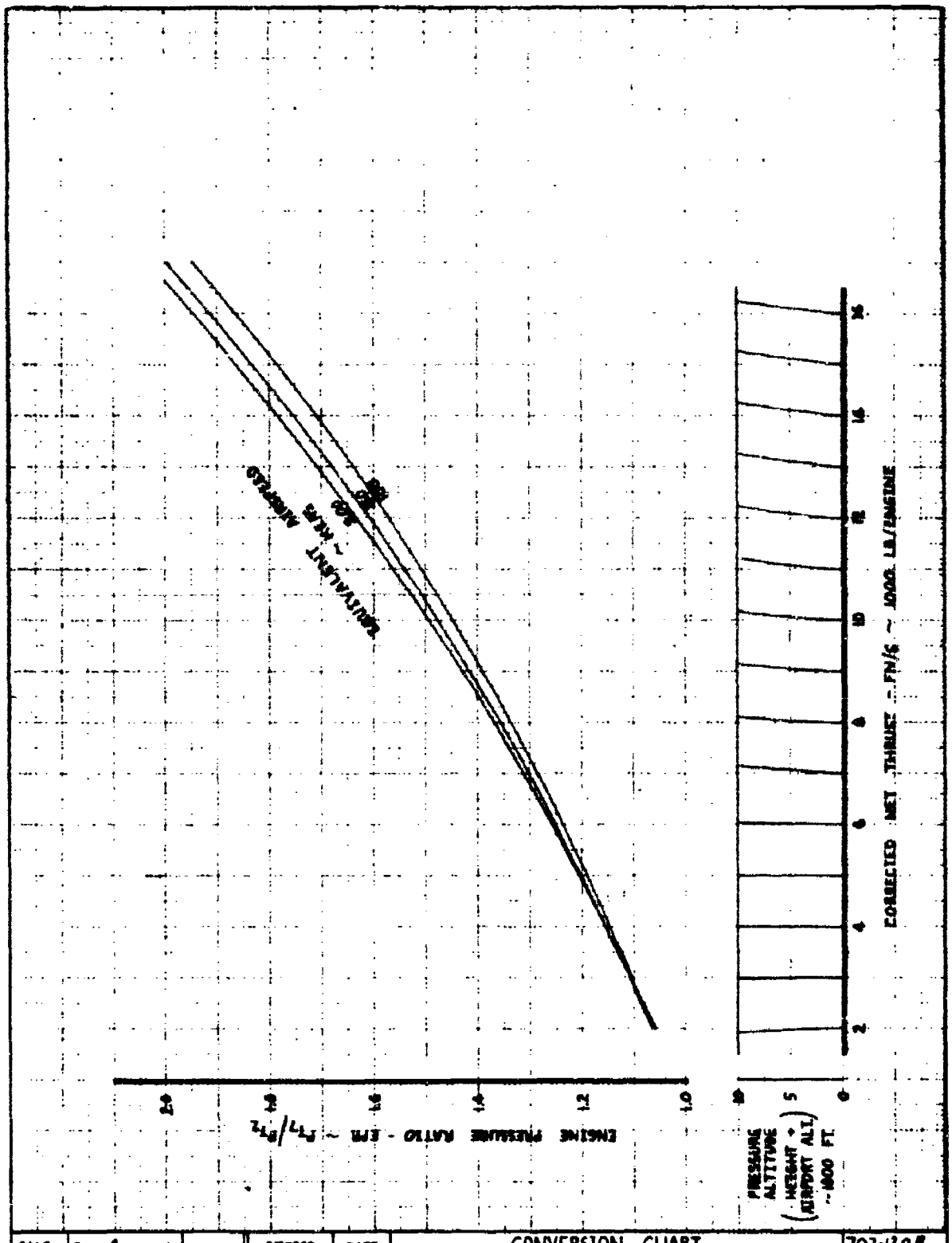

NOTES:
IT AD-1 ENGINES
2. 30° FLAPS
3. 2 DE. SEA
SEA LEVEL, 15°E
NO WIND
EQUIVALENT PROFILE DRAG, WEIGHT = 1000 LB.
EQUIVALENT PROFILE DRAG, 1000 LB.
HORIZONTAL DISTANCE FROM 35 FEET — 1000 FT.



CALC	R.E. Buchholz	8-30-71	REVISED	DATE	GENERALIZED TAKEOFF THRUST	720 B
CHECK	FRASER	9.29.71	R. E. B	10-15-71	JT3D-1 AVG ENGINES	D6-42141-1
APR			✓ FRASER	10.16.71		
APR					THE BOEING COMPANY	PAGE 7.2.14
INK	SCHROEDER					

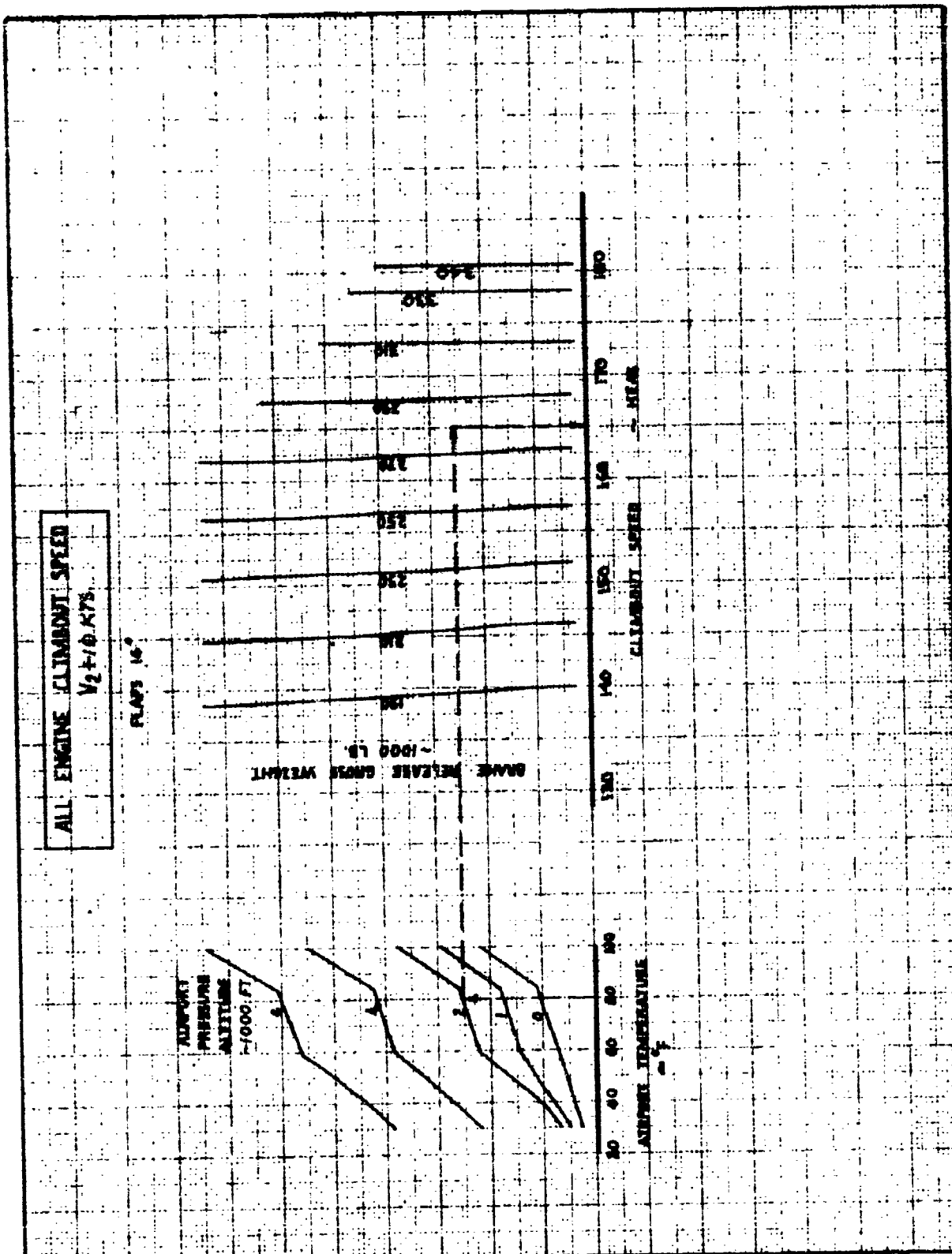
D1-4101-324

H+E ALBANENE 1001



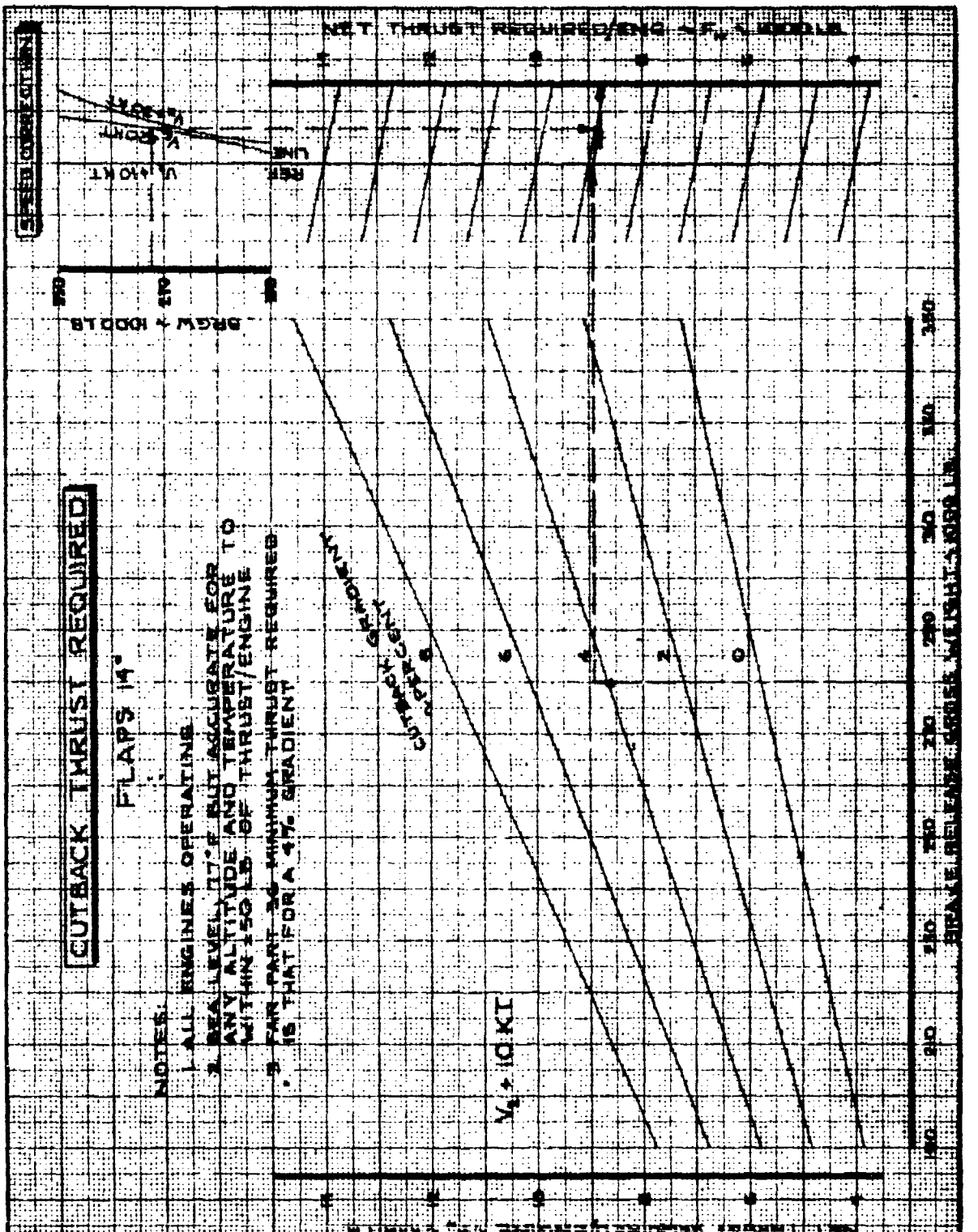
CALC	R. E. Buchholz	9-10-73	REVISED	DATE	CONVERSION CHART CORRECTED NET THRUST TO ENGINE PRESSURE RATIO JT3D-3, JT3D-1	707-1208 7208 D6-42141-1
CHECK	FRASER	9-29-73				
APR						
APR						
INR	W.G. BROOKS	9/11/73			THE BOEING COMPANY	PAGE 7 2-15

7.3 707-300B Advanced/C Aircraft with JT3D-3B(1C) Engines



CALC	A. E. Buchholz	9-7-73	REVISED	DATE	ALL ENGINE CLIMBOUT SPEED FLAPS 14° JT3D-3B (IC) ENGINES
CHECK	FRASER	9-24-73			
APR					
APR					
INK	W.G. BROOKS	9/10/73			THE BOEING COMPANY

707-300
BAdv.-/C
D6-42141-1
PAGE
7.3.1



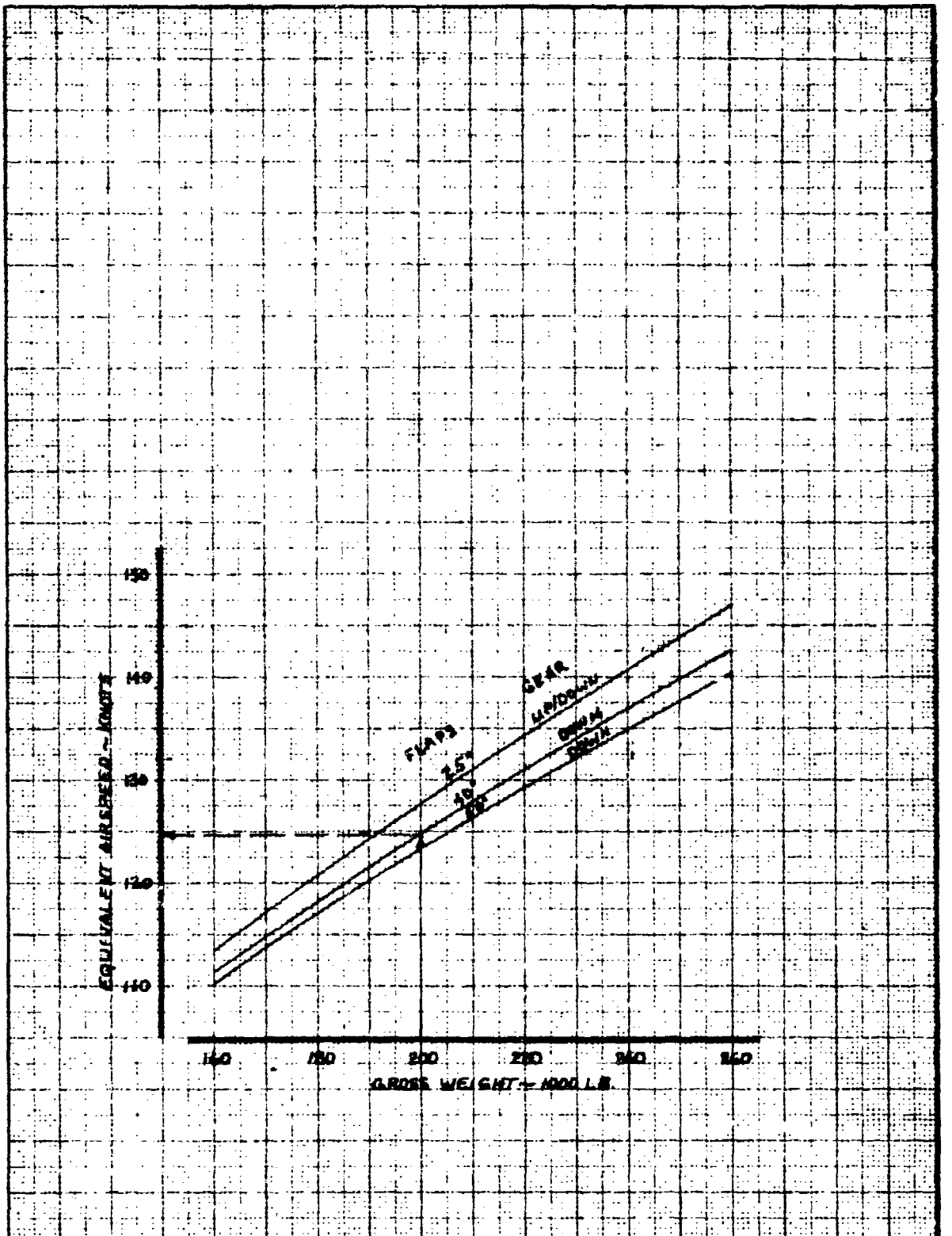
CALC	SCHROETER	8/8/73	REVISED	DATE	CUTBACK THRUST REQUIRED V_2 + 10 KT FLAPS 14°
CHECK	FRASER	9-24-73			
APR					
APR					
INK	SCHROETER				

707-300 BAOV /C

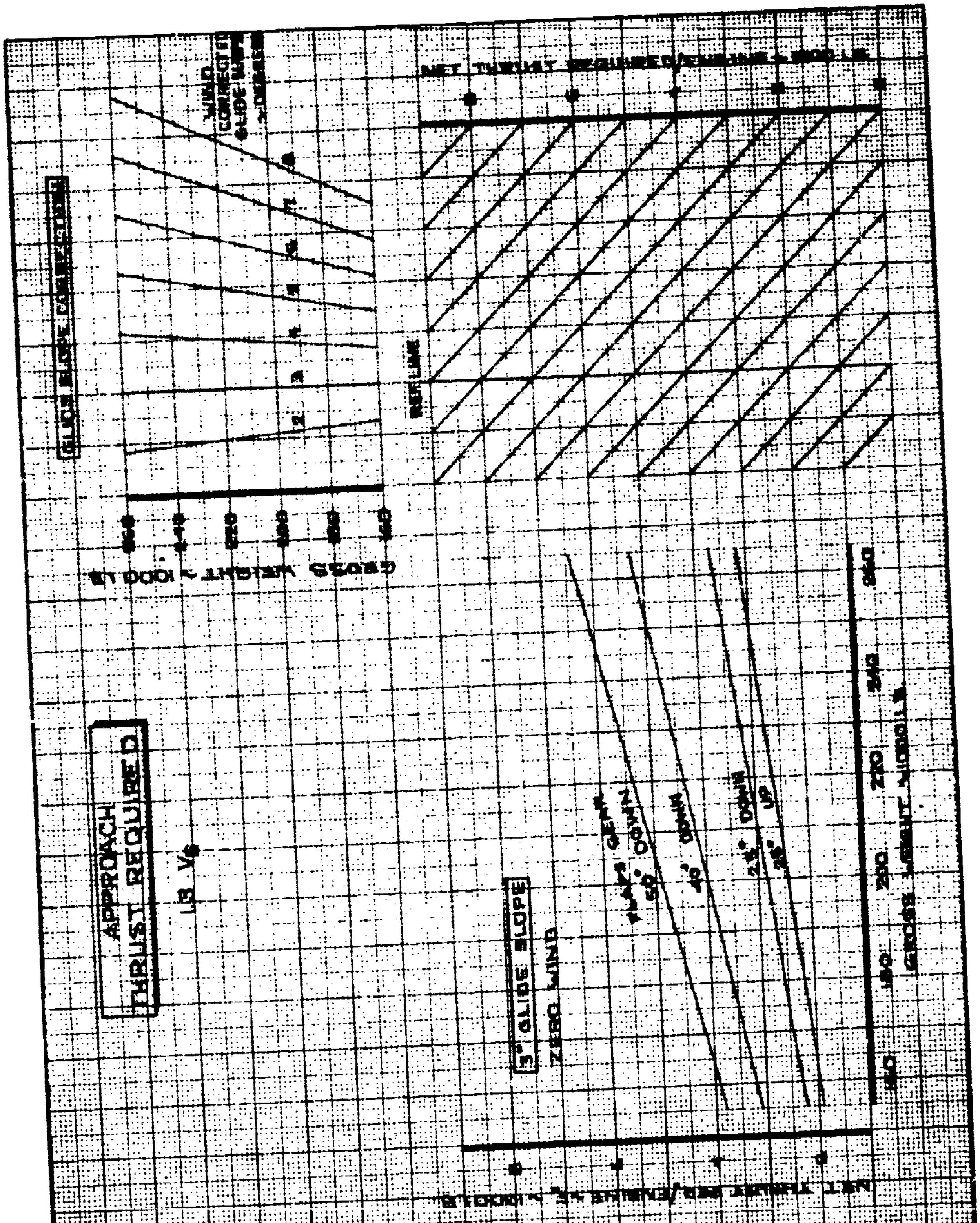
D6-42141-1

THE BOEING COMPANY

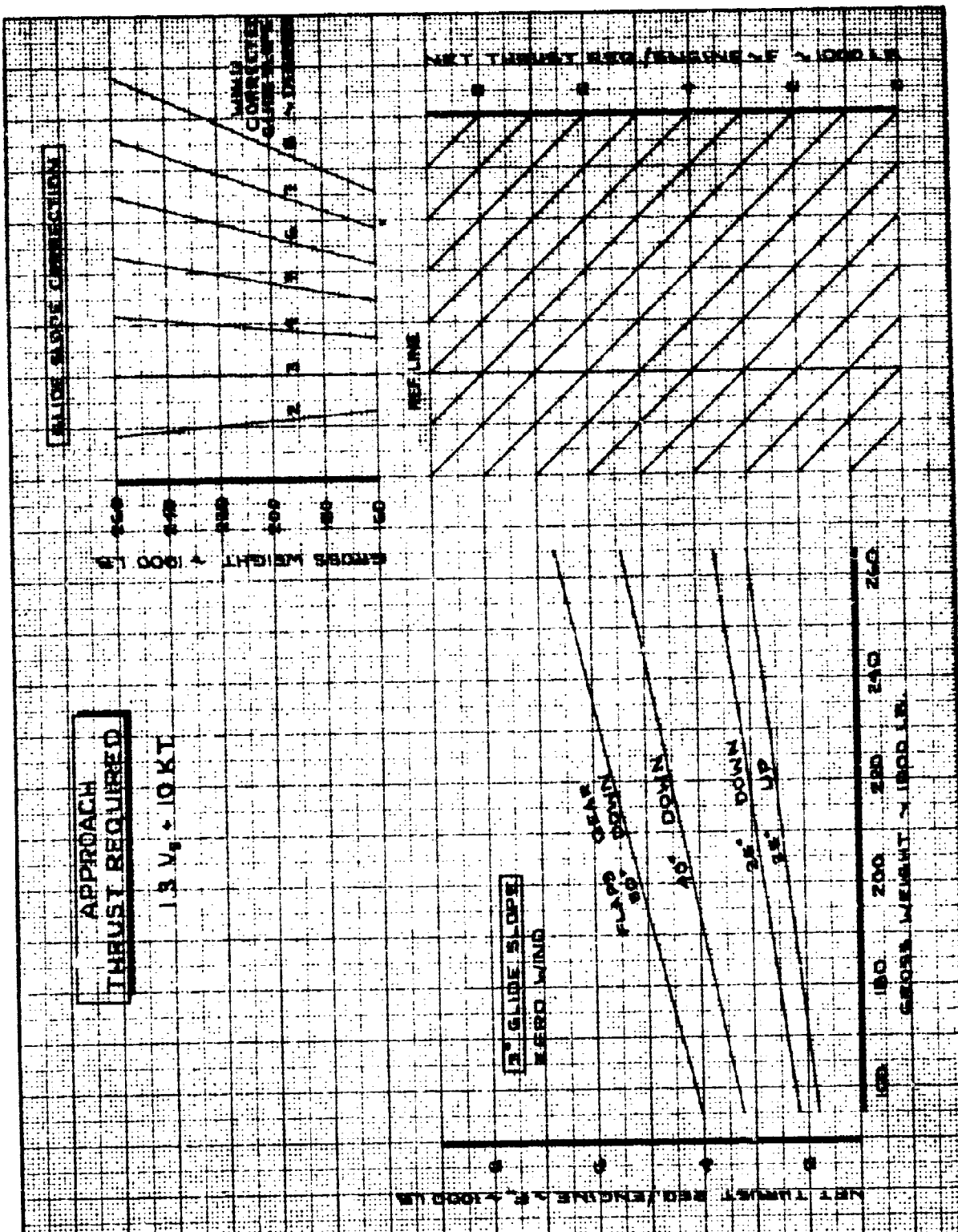
PAGE 7.3.2



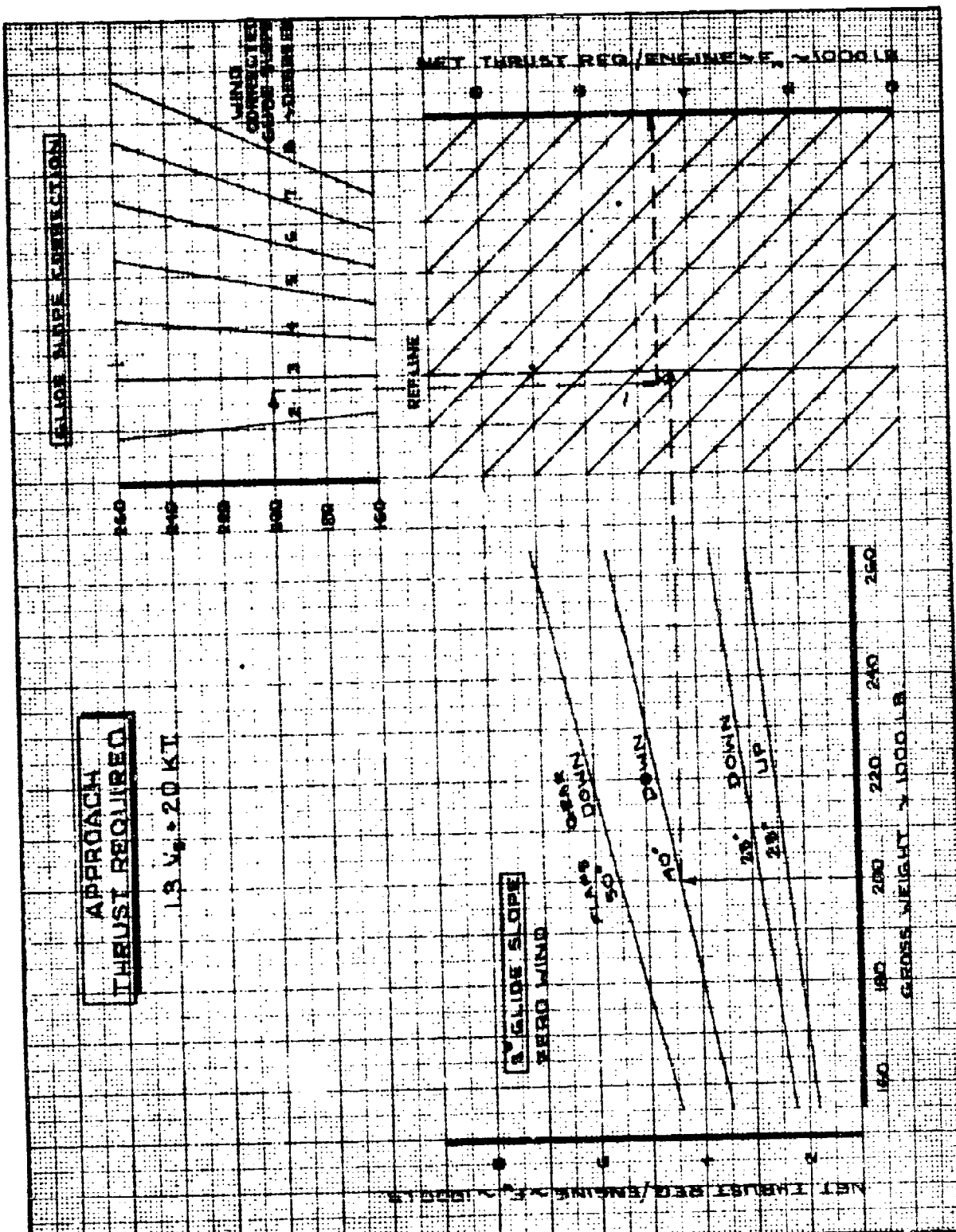
CALC	R.E. Buchholz	9-26-73	REVISED	DATE	APPROACH SPEED 1.3 V_S	707-300 B/C
CHECK	B.G. Williams	9-26-73				D6-42141-1
APR						
APR					THE BOEING COMPANY	PAGE 7.3.3
INK	SCHROETER					



CALC	SCHROETER	8/7/73	REVISED	DATE	APPROACH THRUST REQUIRED 1.3 Vs	707-300 B/C
CHECK	FRASER	9.24.73				D6-42141-1
APR					THE BOEING COMPANY	PAGE 7.3.4
APR						



CALC	SCHROETER	8/7/73	REVISED	DATE	APPROACH THRUST REQUIRED 1.3 V_S + 10 KT	707-300 B/C
CHECK	FRASER	9-26-73				D6-42141-1
APP					THE BOEING COMPANY	PAGE 13.5
APP						

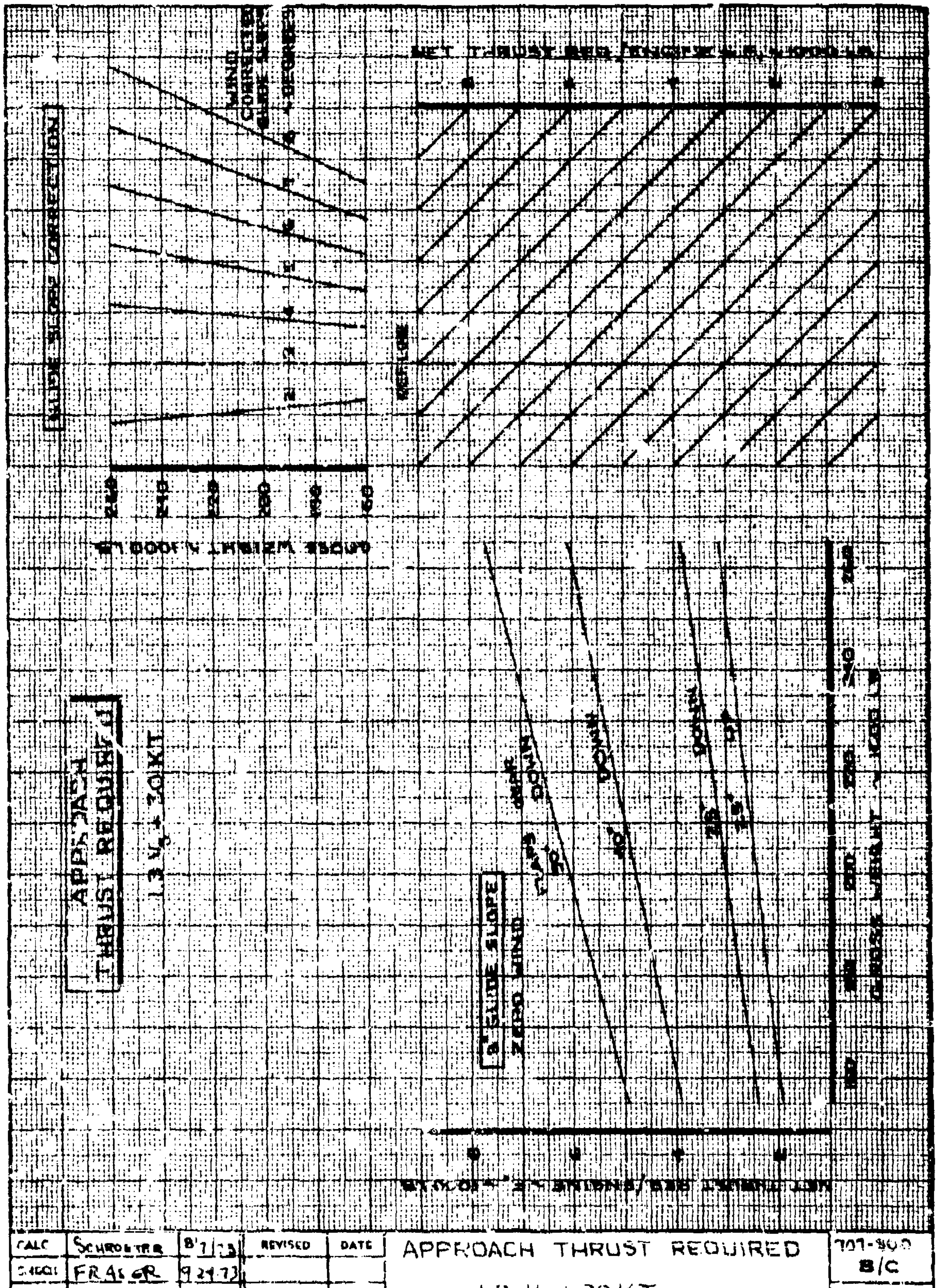


CALC	SCHROETER	8/7/73	REVISED	DATE	APPROACH THRUST REQUIRED 1.3 V_S + 20 KT THE BOEING COMPANY
CHECK	FRASER	9-24-73			
APP					
APP					

707-300 B/C

D6-42141-1

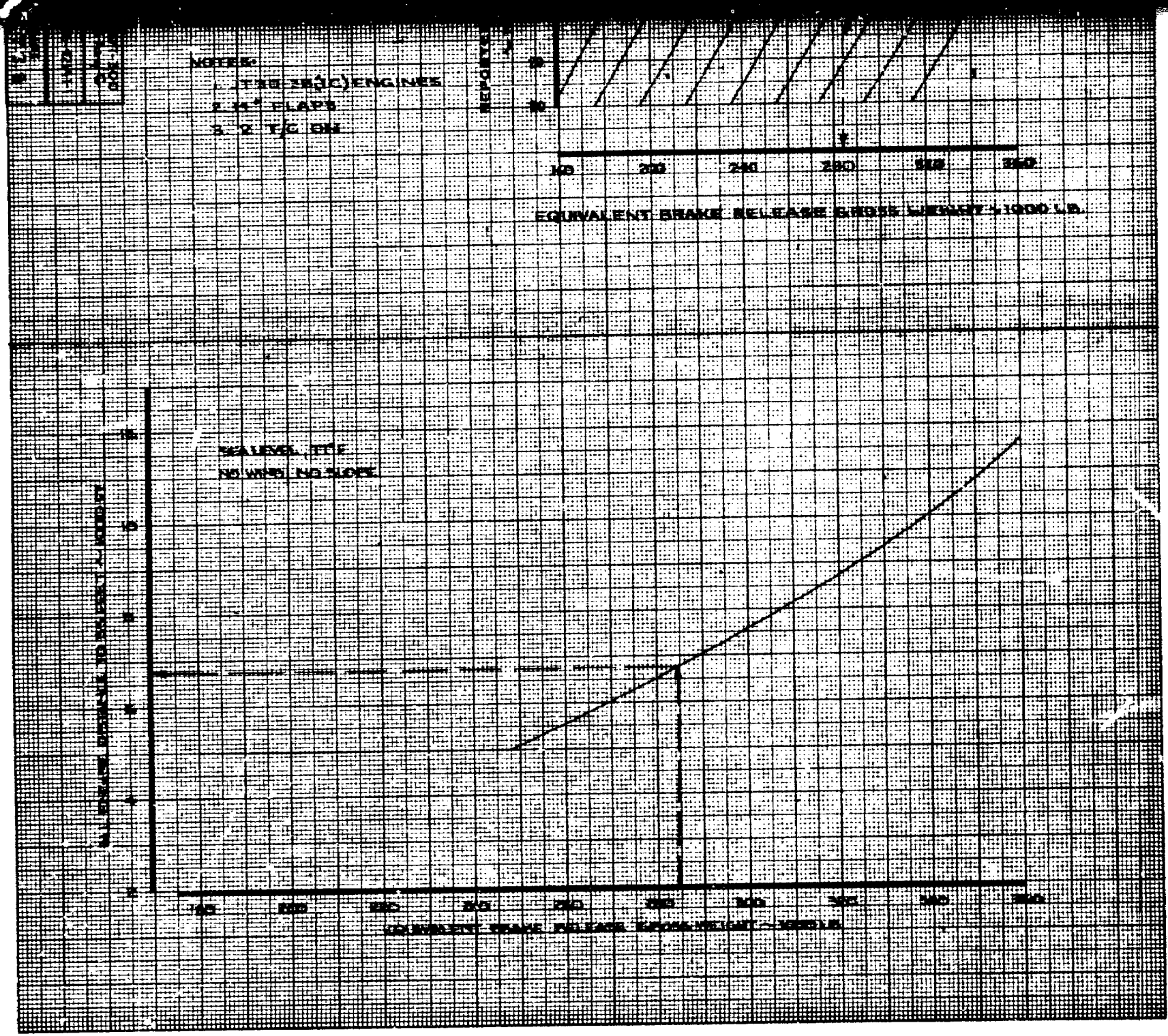
PAGE 7.3.6

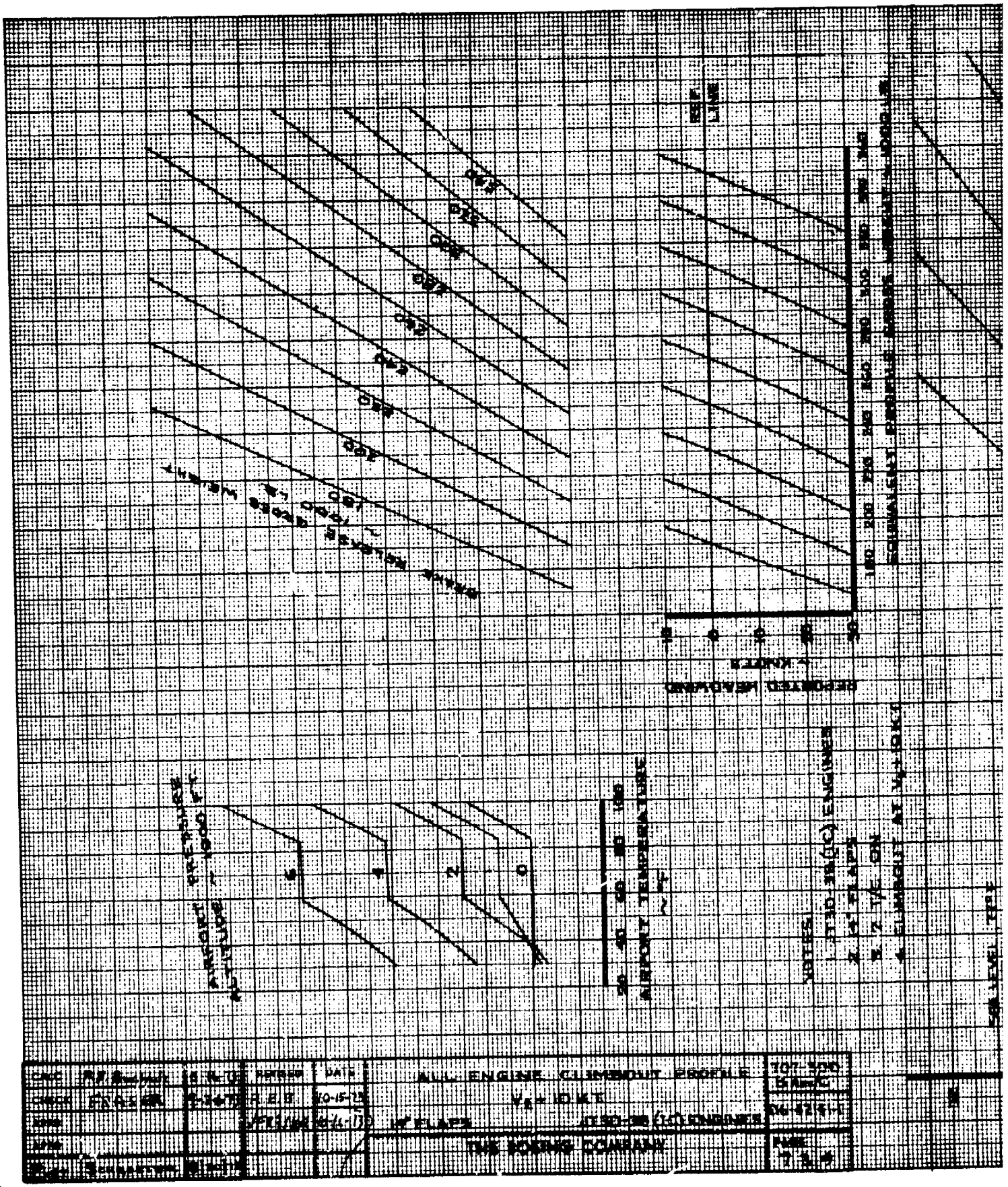


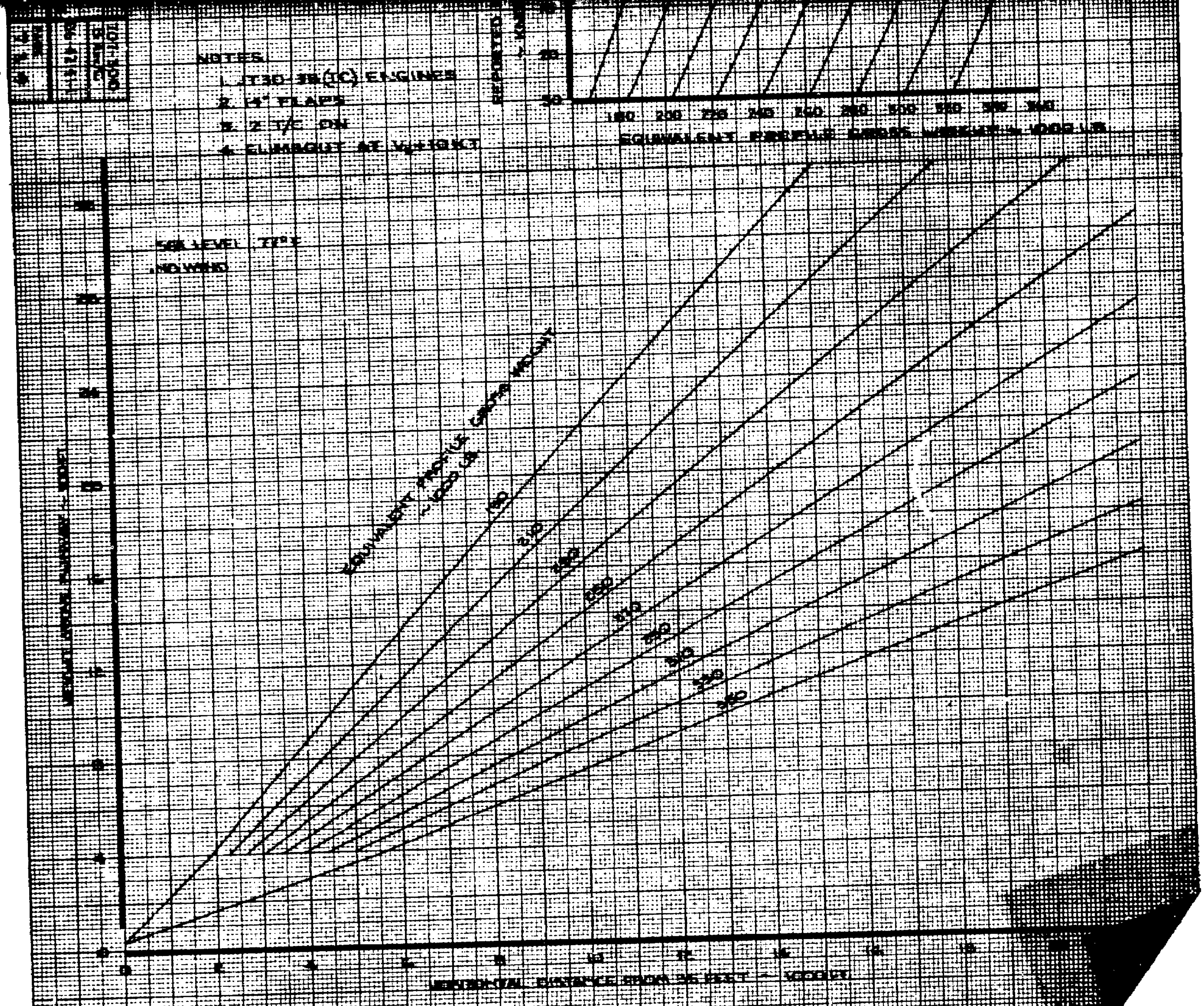
CALC	Schroeter	8/7/73	REVISED	DATE	APPROACH THRUST REQUIRED 1.3 V_S + 30 KT	707-300 B/C
CHECK	FRASER	9/24/73				D6-42141-1
APR					THE BOEING COMPANY	PAGE 7.3.7
APR						

D1-4100-56[illegible] ORIG. 3/71

TRACING PAPER ALBANENE


NOTES:
1. JT3D-3B(C) ENGINES
2. 14° FLAPS
3. 2 T/C OAT
REFERENCE
EQUIVALENT BRAKE RELEASE GROSS WEIGHT - 1000 LB.
SEA LEVEL, TTOE
NO WIND, NO SLOPE,
EQUIVALENT BRAKE RELEASE GROSS WEIGHT - 1000 LB.

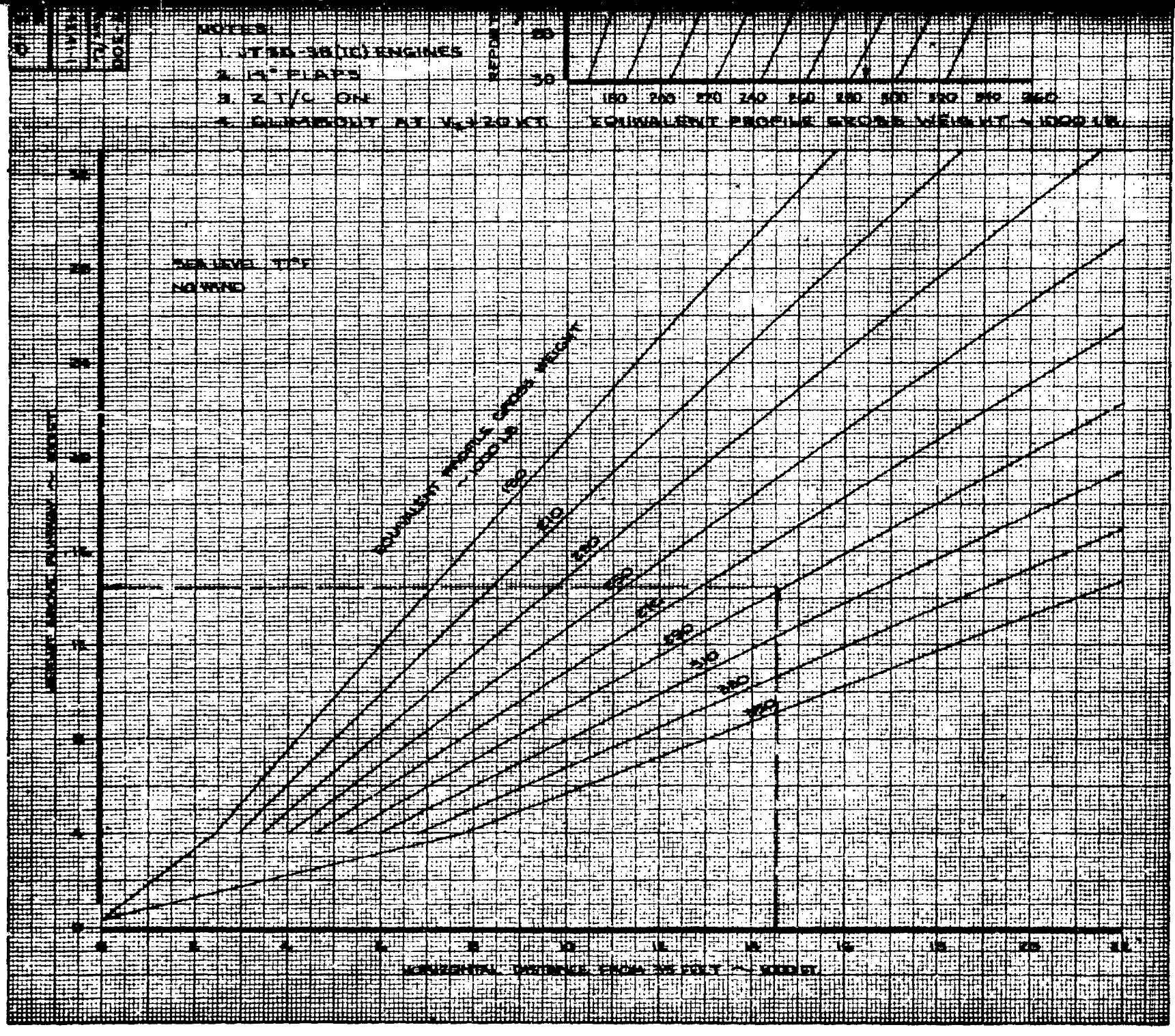



NOTES:
1. JT3D-3B(1C) ENGINES
2. 14° FLAPS
3. 2 T/C ON
4. CLIMBOUT AT V2+10 KT
EQUIVALENT PROFILE GROSS WEIGHT ~ 1000 LB
SEA LEVEL, 77°F
NO WIND
EQUIVALENT PROFILE GROSS WEIGHT ~ 1000 LB
HORIZONTAL DISTANCE FROM 35 FEET ~ 1000 FT

NOTES:
1. JT3D-3B(IC) ENGINES
2. 14° FLAPS
3. 2 T/C ON
4. CLIMBOUT AT V2+20 KT

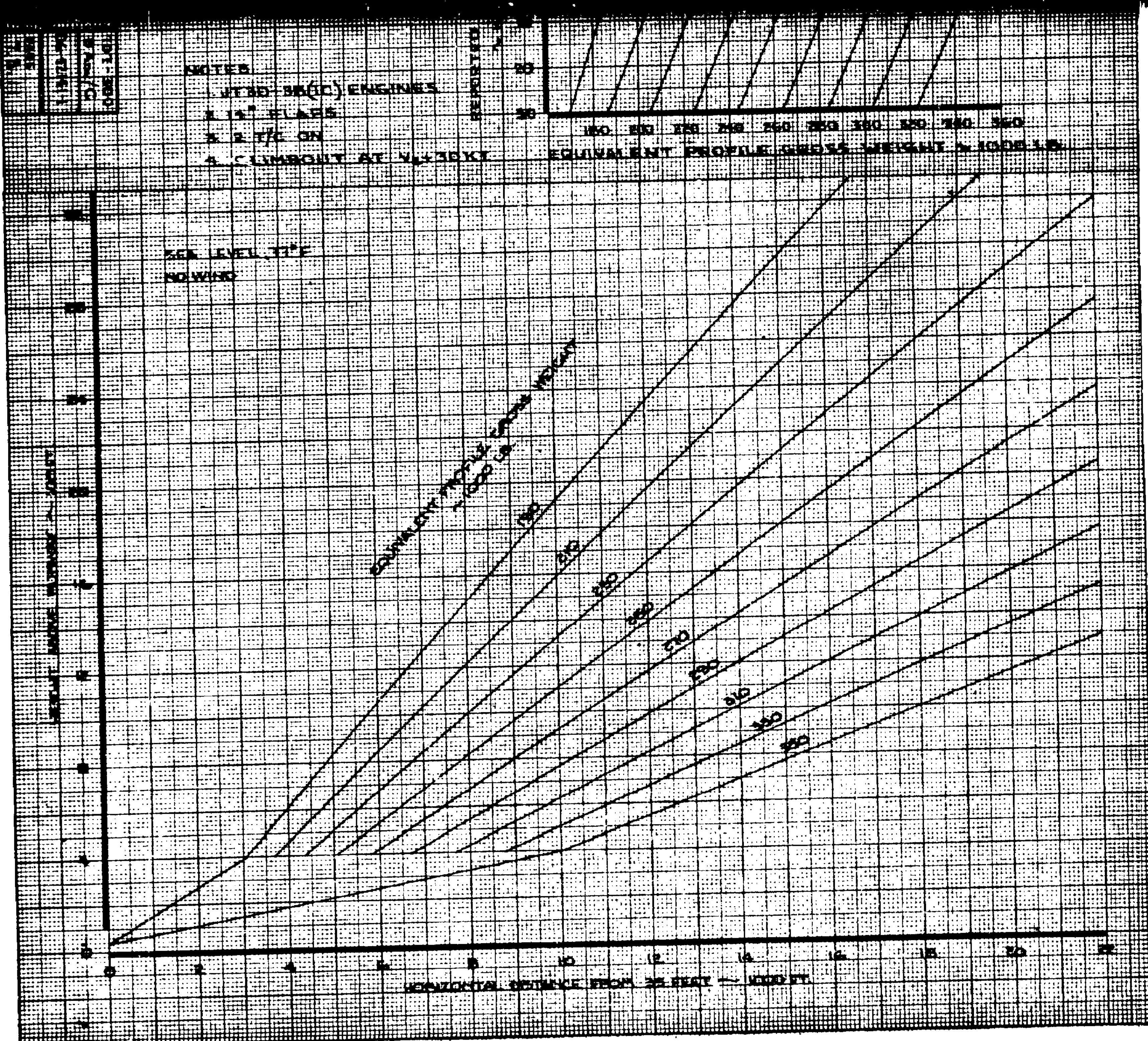
ALL ENGINE CLIMBOUT PROFILE
V2+20 KT
JT3D-3B(IC) ENGINES
THE BOEING COMPANY
707-300

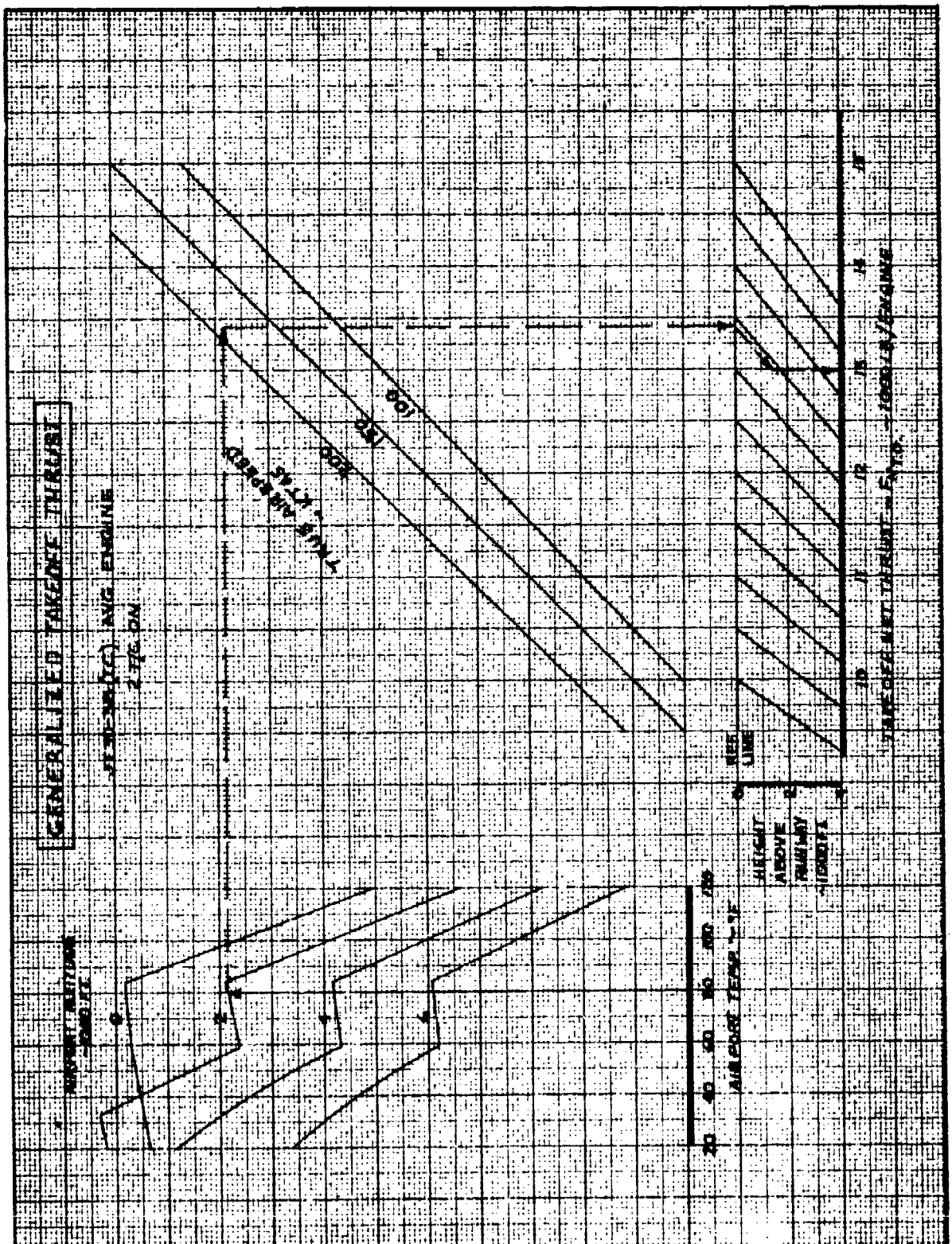
D1 4100-5820 ORIG. 8/71


NOTES:
1. JT8D-9A(1C) ENGINES
2. 14° FLAPS
3. 2 T/C ON
4. GLIDEBOUT AT V_{REF} + 20 KTS
EQUIVALENT PROFILE RANGE WEIGHT - 1000 LBS
SEA LEVEL, TSTD
NO WIND
EQUIVALENT ENGINE GROSS WEIGHT - 1000 LBS
HORIZONTAL DISTANCE FROM 35 FEET - 1000 FT

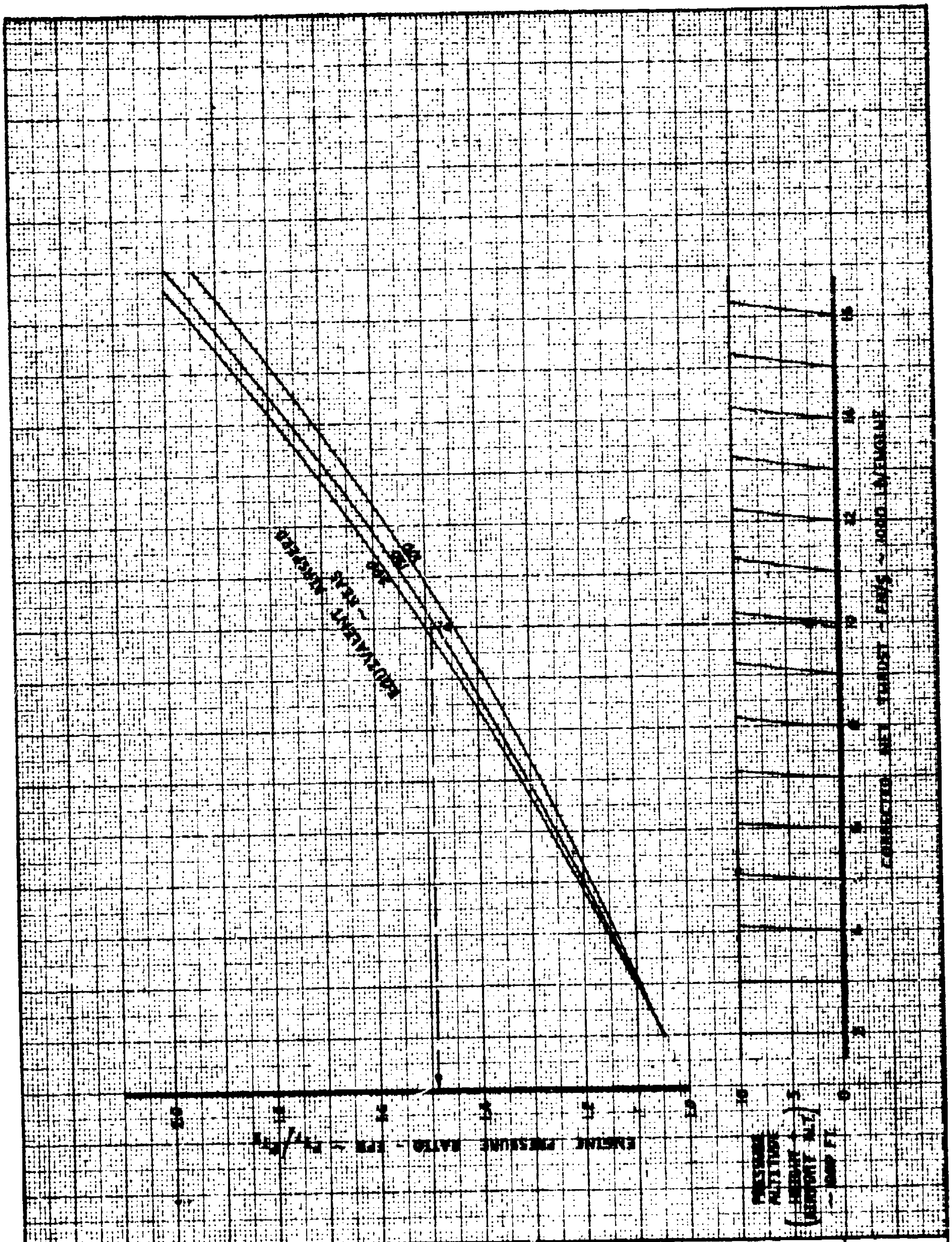
DI-4100-8620 ORIG. 3/71

TRACING PAPER
ALBANENE


NOTES
1. JT3D-3B(C) ENGINES
2. 14° FLAPS
3. 2 T/C ON
4. CLIMBOUT AT V2+30 KT
REPORTED
EQUIVALENT PROFILE GROSS WEIGHT ~ 1000 LB.
160 200 220 240 260 280 300 320 340 360
SEA LEVEL 77°F
NO WIND
EQUIVALENT PROFILE GROSS WEIGHT ~ 1000 LB
HEIGHT ABOVE RUNWAY ~ 100 FT
HORIZONTAL DISTANCE FROM 35 FEET ~ 1000 FT.
0 2 4 6 8 10 12 14 16 18 20 22



CALC	R. E. Buchholz	8-30-71	REVISED	DATE	GENERALIZED TAKEOFF THRUST
CHECK	FRASER	9-24-71	R.E.B.	10-18-71	707-300 BAdv./C
APR			ERASER	10-16-71	JT3D-3B(IC) AVG. ENGINES — D6-42141-1
APR					THE BOEING COMPANY — PAGE 7.3.12
INK	SCHROEDER				



CALC	R. E. Buchholz	9-7-73	REVISED	DATE	CONVERSION CHART CORRECTED NET THRUST TO ENGINE PRESSURE RATIO JT3D-3B (IC) ENGINES	707-300 B Adv./C
CHECK	FRASER	9-24-73				D6-42141-1
APR						
APR					THE BOEING COMPANY	PAGE 7.3.13
INK	W. B. BROOKS	5/11/73				